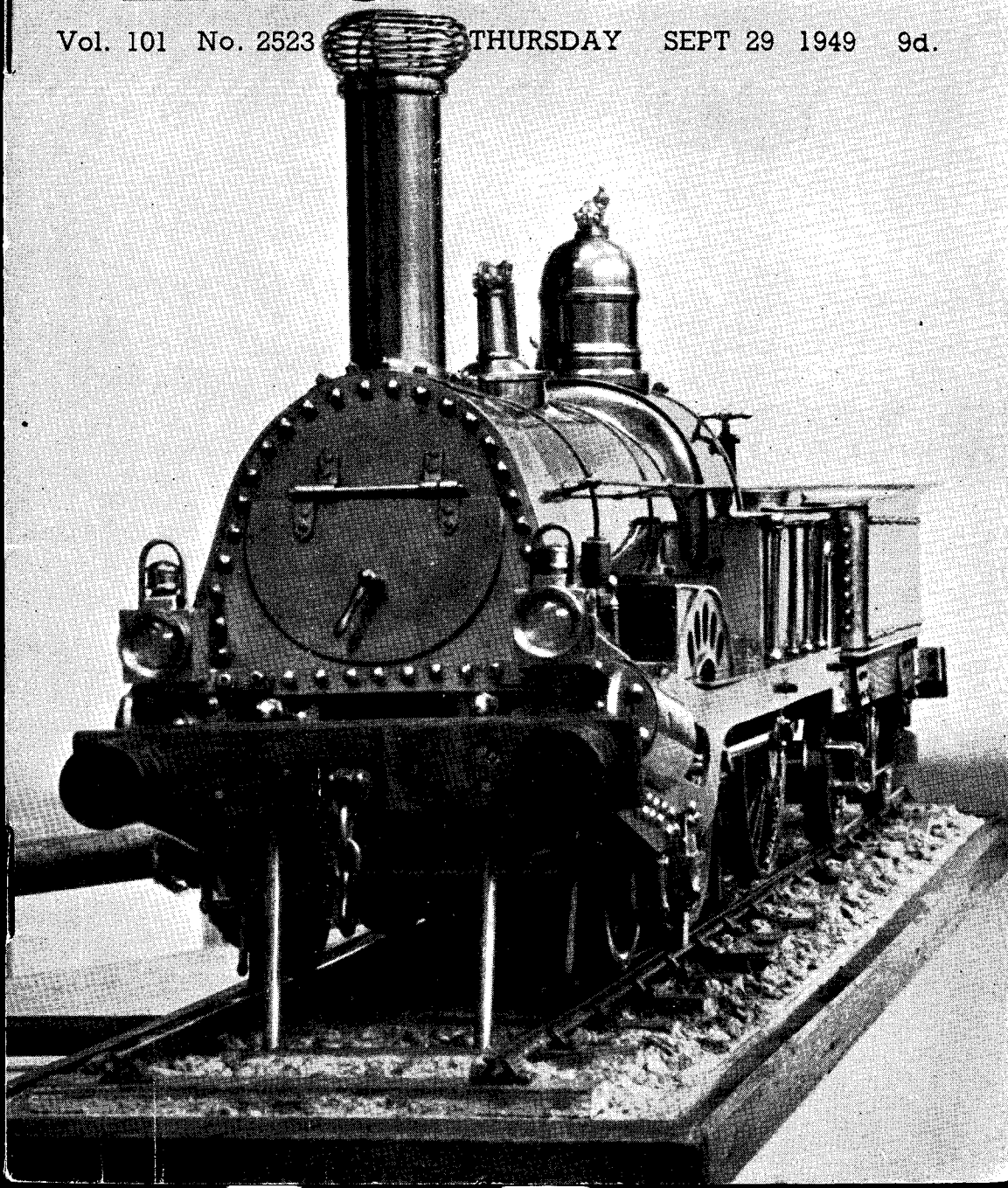
# THE MODEL ENGINEER

Vol. 101 No. 2523 THURSDAY SEPT 29 1949 9d.



# The MODEL ENGINEER

*PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2*

29TH SEPTEMBER 1949

VOL. 101 NO. 2523



# SMOKE RINGS

### "M.E." Exhibition Diplomas

● WE KNOW and appreciate that the winners of diplomas are always anxious to receive these awards as quickly as possible after the exhibition is over. On our side, we are just as anxious to see that this need is promptly met. Already, one or two people have written to ask if their diplomas have been dispatched yet, and we are sorry to be obliged to give a negative reply, for the moment. Each diploma has to be filled in, by hand, with the name of the competitor and particulars of his winning entry; it then has to be signed by, at least, the Chief Judge and, in certain instances, his colleagues in the various classes. Owing to the number of such awards won this year, the process of completing the diplomas must take a few weeks; but winners may rest assured that the matter is being dealt with as expeditiously as possible, and that probably by the time this note is published the dispatch of diplomas will be well in hand.

### Our Cover Picture

● THIS EXCELLENT model of the historic locomotive *Crewe*, was discovered on the stand of the London S.M.E.E. at the recent "M.E." Exhibition, and is of interest, not only as a record of the form of locomotive design which was popular in the middle years of last century, but also as an outstanding specimen of model engineering. It was built by Mr. D. H. Harris, and is correct in all details, except for modifications of working detail, which were considered desirable to make it successful as a working model. These include the use of larger and fewer boiler tubes, and alterations to the feed-pump. The engine has not yet run under steam, but has worked quite successfully on air, and there is every reason to believe that the boiler would steam quite satisfactorily. The prototype was built in 1851 by Alexander Allen for the London & North Western Railway. It is of the 2-4-0 type, and equipped with Stephenson link reversing gear. Authentic models of these fascinating old-time locomotives are still sufficiently rare to make news, and, particularly when as well made as the example illustrated, are a never-ending source of interest to the lover of both full-sized and model locomotives.

### Mr. O. V. S. Bulleid Retires

● IT IS probably with mixed feelings that most locomotive enthusiasts will receive the news of the retirement of Mr. Oliver Vaughan Snell Bulleid, Chief Mechanical Engineer of British Railways Southern Region. Whatever we may think, individually, of Mr. Bulleid's contributions to British locomotive engineering, few of us can deny that his Pacifics of the "Merchant Navy," "West Country" and "Battle of Britain" classes, and

his fearsome-looking 0-6-0 freight engines of the "Q1" class, possess features which, to say the least, are unusual and original in locomotive practice. To these must be added the new "Leader" class of 0-6-0 + 0-6-0 wheel arrangement and classified as general-purpose tank engines, which have been designed to give maximum operational scope over a very wide range of traffic requirements and are probably the most revolutionary of all Mr. Bulleid's creations.

To builders of miniature locomotives, Mr. Bulleid's work has not, so far, appealed very strongly, partly because the new features are, as yet, incompletely understood; and this, in itself, may be due to the lack of full technical explanations and descriptions of the more important of Mr. Bulleid's novelties. Then there is the fact that the appearance of the engines themselves is so totally at variance with what the average locomotive enthusiast thinks it should be, that there is quite a widespread revulsion of feeling against the engines, and this may take some years yet to overcome.

Be all this as it may, Mr. Bulleid obviously has a strong faith in the steam locomotive, as such, and he believes that progress and development are hardly possible without trying new ideas and experiments which depart from orthodox practice; and only time can prove whether he is right or wrong.

Mr. Bulleid is leaving England to take up a post as Consulting Mechanical Engineer to the Irish Transport Company, a post in which his unconventional ideas may find plenty of scope. He has spent 48 years of his life in the service of railways, mainly at Doncaster; 12 years ago he was appointed Chief Mechanical Engineer of the Southern Railway, in which capacity he has developed his own ideas and made himself known all over the world. His departure for Eire takes him back to his native soil, and his future work will be watched with more than ordinary interest by locomotive enthusiasts everywhere. The preservation and restoration of an L.B. & S.C.R. "Terrier" and an Adams 4-4-0, under his auspices, however, is something for which we must all be eternally grateful.

## Whose Launch?

● OUR QUERY under this head in the August 4th issue has brought in several letters which, however, do not seem to have answered the question very definitely. Mr. A. G. West, of the Staines and District Society of Model Engineers, wonders if the launch is the same one which he saw some time ago at Sunbury Lock. This vessel was named *Erg* and had a water-tube boiler fired by a "Primus" burner; the engine appeared to be a 2-in. Stuart Turner vertical, complete with feed-pump. Mr. G. J. Davis, of Cricklewood, believes it to have been one of two which are normally moored at a boat-hire establishment about half-way between Bourne End and Marlow; one of these, Mr. Davis states, is named *Firebird*.

Mr. A. W. Fithian, of Parkstone, and Mr. F. G. Morris, of Surbiton, however, both claim that it was an ex-naval pinnace named *Osborne* which was used by Queen Victoria when she used to stay at Osborne, and now belongs to a Mr. Hickey, of Richmond.

Mrs. D. Rowland, of Leatherhead, has put in what appears to be the strongest claim, so far. She states that "this snivelling little steamer with the 'Admiral's spitoon' on the funnel belongs to my husband. The engine to match the handsome brass spout is a Stuart of sorts, but not of such a high order as a triple because, he tells me, it has only one lung! If the correspondent wishes to have a trip on her one Sunday afternoon, it can be arranged, as the 'M.E.' will know quite well who she belongs to when it receives this note."

Well, there we are! And do we detect some connection between the first and the last on the list? But, in any case, there seem to be more steam launches than we thought there were on the Thames.

## A Society to be Homeless?

● IN THE Salisbury and District Model Engineer Society's News Sheet for September, we noticed the following paragraph from the Hon. Secretary, Mr. R. A. Read, 7, De Vaux Place, Salisbury.

"After ten years' occupation of our workshop we have received notice from the landlord to leave by the middle of November. We have been trying for the past two years to find better accommodation, but now matters have been brought to a head and our need is urgent. Without a workshop, we shall have to put our equipment in store and hire a room for meetings, which will mean that we shall be able to meet only once or twice a month. We want to avoid this if possible, so will all members do their utmost to find fresh accommodation by personal search or enquiry of likely persons, and let me know immediately anything turns up. A large lock-up garage, loft or store is required, preferably not on licensed premises and away from houses so that the noise of engine testing will not be a nuisance to neighbours. Alternatively, a site on which we could erect a hut might be considered. Whatever happens, the society will continue to function, and in this time of need requires the support of all possible members."

In the hope that there may be readers, not members of the above society, who can help in some way, we have pleasure in giving publicity to the above appeal.

## A Proposed Model Engineering Society

● WE HAVE been asked by Mr. O. P. Corderoy to call the attention of readers in the Heston, Isleworth and Hounslow district to a move now in progress for the formation of a model engineering society in that locality. Assistance in this matter has been promised by the local Press, and a suitable meeting room has been offered at the Blackhorse Hotel, Isleworth. Interested readers are asked to get in touch with Mr. Corderoy, at 90, Worton Way, Isleworth.

It may be mentioned that Mr. Corderoy is a keen model boat builder, and a description of his cabin cruiser *Barbara*, which was exhibited at our recent "M.E." Exhibition, appeared in our issue of September 1st.

# *TWIN SISTERS

## by J. I. Austen-Walton

**Two 5-in. gauge locomotives, exactly alike externally, but very different internally**

"IT seems a shame," as the immortal Lewis Carroll once wrote in his little verse about the Walrus and the Carpenter, when he referred to the oysters, "To bring them out so far, and make them walk so fast."

I cannot for ever dwell on the larger and more interesting parts of the engines in these pages, without turning you back to some more fiddling bits that have got to be made some day, and I have brought you out so far, and made you walk (in some issues) at quite a reasonable pace.

If you have kept up with the notes, and have made no serious mistakes, you should now have the engine standing on its wheels, which is quite a substantial step forward; but, all along the line, fresh questions keep cropping up, such as one I had last week.

"Why is it necessary to put rubbing washers between the wheels and axleboxes?" There is quite a history attached to that, as during my stay in Chesterfield last year, when the boys of the Chesterfield Society entertained me so thoroughly, it was pointed out that the 4¾-in. gauge, or correct 1 in. scale was much more popular than down in the South. I think it was then known to the lads that a new type of locomotive was about to boil up, and they tackled me on this very point.

I promised that, in the event of the new locomotive appearing in THE MODEL ENGINEER I would make the necessary provision for builders in this gauge. To do this, delete the rubbing washers and machine an extra $\frac{1}{16}$ in. off the backs of the wheel bosses, and shorten the axles by $\frac{1}{2}$ in. This will give just the same clearances and freedom for wheel float, and still enough room between the backs of the wheels and the sides of the frames. Well, that's one bogey (or should I say "bogie"?) laid.

Then I have had a query from one of the fellows who likes to look well ahead; he says, "I am worried about cylinders, and still feel a little uncertain about using cast-iron. The trouble is with the rusting one is supposed to get." I have already given my own and most carefully considered views on this problem, and I am still waiting for someone to walk up to my door with a cast-iron cylinder, hopelessly rusted, and say, "See? so *there*."

Moreover, I have no intention of being dogmatic about this evergreen problem, but I can

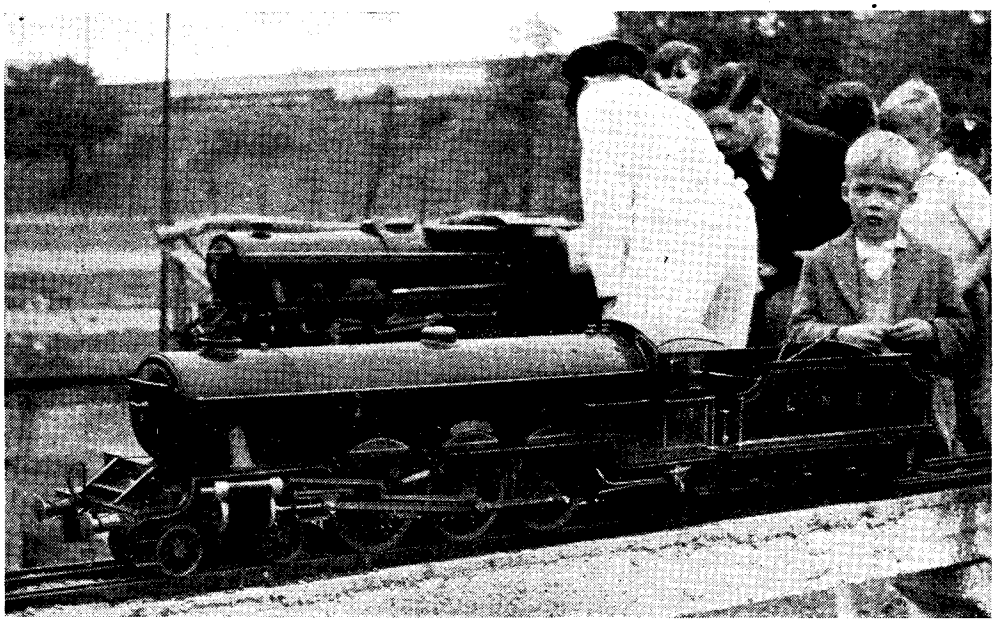


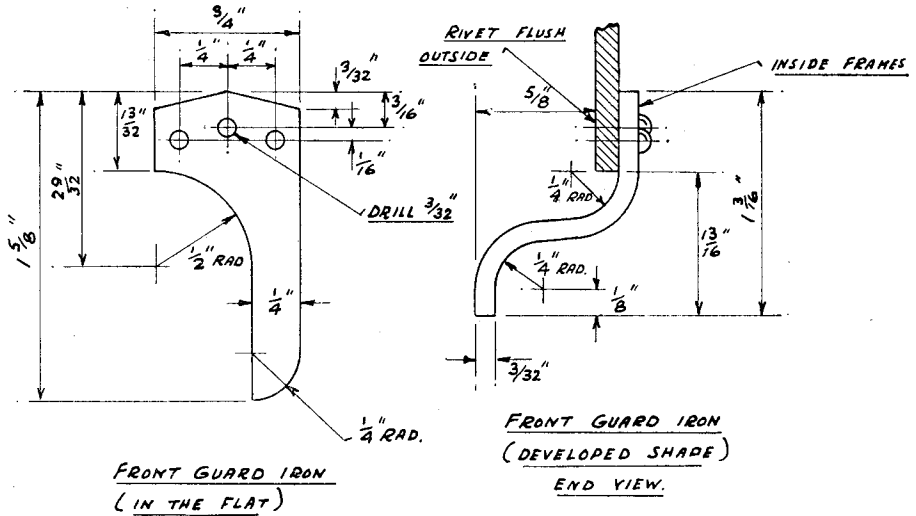
*Photo by*] "*The Pirate*" [*A. Duncan*

*Continued from page 265, "M.E.," August 25, 1949.

tell you that two pairs of cylinders, cast in "Meehanite" and now fully machined, just refuse to rust under any pretext. When I tell you that I am one of those unfortunate people who has only to look at a piece of steel at less than a foot range, and it immediately becomes irreparably pitted with rust, you will understand why I use stainless-steel so much.

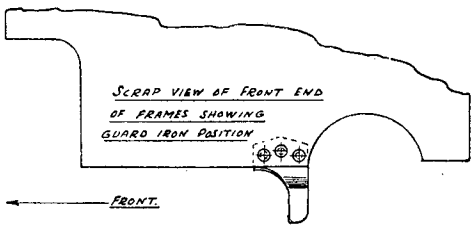
If it had not been for this unfortunate property,

In other directions, too, I want to give readers hope regarding a problem that weighs heavy on the minds of those who dread the days to come, when the paint pot looms large—to paint or not to paint? The photograph shows a 3½-in. gauge, three-cylinder Pacific, built by that well-known enthusiast, Mr. B. Jenner, of the Malden Society. He has named her "The Pirate" and I have driven her once or twice, and can vouch for the




FRONT GUARD IRON (IN THE FLAT) ELEVATION.

FRONT GUARD IRON (DEVELOPED SHAPE) END VIEW.




I might not have spent so much time studying stainless-steel, and how best to work and use it, so that, in the end, it has turned out quite well for everyone concerned.

There is no accident about this rust-resisting property in "Meehanite" and the makers recommend its use where rust-forming conditions prevail. So that is the answer to the cylinder problem, other than the alternative given in the form of gunmetal cylinders.

Talking of castings brings me to a question of supply, and I am pleased to announce that our mutual friends, Kennion Bros., of Hertford, are going out of their way to provide materials that should have all the qualities I so much like to see in the class of work in which I specialise. I admit to being a bit of a tinker where quality and finish are concerned and, although I like good, clean and accurate work just as dearly, I see no reason why good material and finish should not go with it, hand in hand.

wonderful performance she puts up. Since then, the record lap for the Malden track has been secured by her. One day last year, Mr. Jenner came down to stay a little while with me, and his unpainted engine was tucked underneath his arm. I let him have the use of my stoving oven, and some paint, and more or less left him to it. His language was frightful, and at one stage I thought I would have to redecorate the place, but the finished article was very trim and neat, and appears to be standing up to the wear and tear of the track.

After that experience, I didn't worry about being able to put readers on the right track for painting—even brush painting.

And now to business, and some of the threatened details for the frames, ideal "hot weather" items at the time of writing.

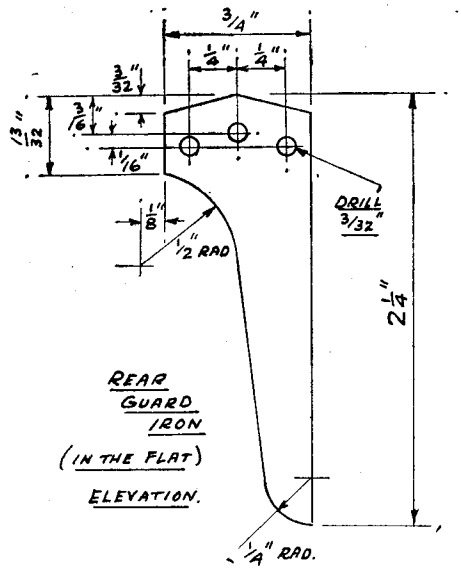
The guard-irons shown are simple enough, and in each case the form when laid out flat, is given. It is just as well to err on the generous side for length when marking-out, as I have found that slightly different bends affect the finished height above the railhead. In any case, it is easy enough to shorten the parts a little after bending; but overdoing the length is just as bad, in that it may cause rubbing on the railhead with the amount of springing provided for the engine, which is more than on the prototype. The distance out from the side of the frames would also be affected if 4¾-in. gauge were chosen, in which case ⅛ in. should be deducted from the dimension given. Note also that both front and

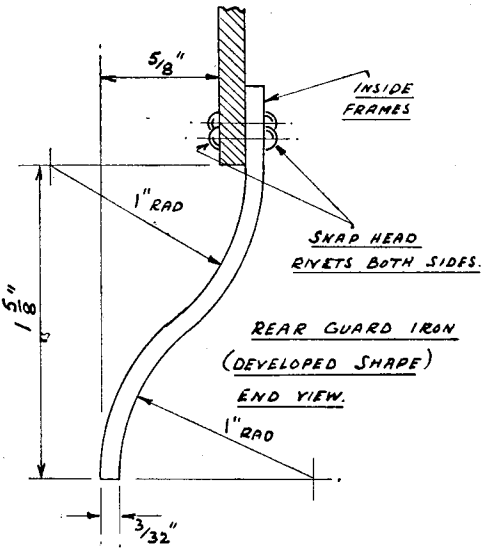
rear irons are attached to the inside of the frames, and that countersunk rivets are essential for the fixing of the front irons, otherwise you will be in trouble when fitting the cylinders. These parts can go on for good, and there is no question of service bolts.

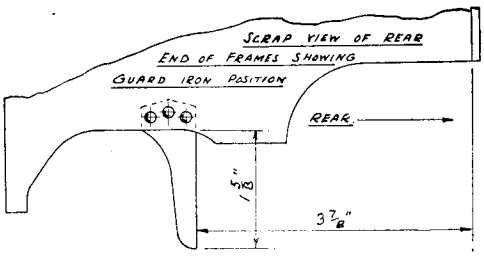
The draw-hooks and parts, usually the very last item on the works list, can be made now if desired—usually I clean up as I go. This is a detail that is useful to keep on the list of jobs "to be tackled as a change." Personally, I do not always feel in a mood for boring cylinders, or doing other highly accurate work, and then it is a change to be able to sit at a bench, and just scratch away at something—a grand cure for getting "browned off" with a job.

The rubber insert in the draw-hook eye was made from a slice of old rubber tube, $\frac{1}{4}$ in. i.d. by $\frac{1}{8}$ in. o.d.; but, if necessary, the eye could be bored out to suit whatever size tube was to hand, within reason, of course. To assemble, braze the rod into the eye, insert the rubber, push the free end of the rod through the plank opening, from inside, and screw on the hook. Push back the eye into the bracket opening and insert the pin. By screwing up or unscrewing the hook, the correct length may be found which allows the hook to swing in its slot without binding, and once this position has been found, the square behind the hook prevents further movement until the whole lot is released by withdrawing the pin from the brackets.

The easiest way to produce the chain is to make up a short bar of steel of the same section as the inside of the chain link. Take a piece of $\frac{1}{8}$ in. steel wire, and pinch one end of it in the vice between the forming-bar held by one end, horizontally, and the wire standing up vertically. Now wind the wire round the bar, pressing it in close to the bar to keep the link shape correct, and continue until seven or eight turns are complete to allow for one or more spoilers. Remove the bar, and with a hacksaw, cut down the middle of one of the long sides of the links. Do not pull the staggered ends of the wire into line until the links and hook are assembled, when they can be cleaned and either brazed or welded. Finally, clean and polish.



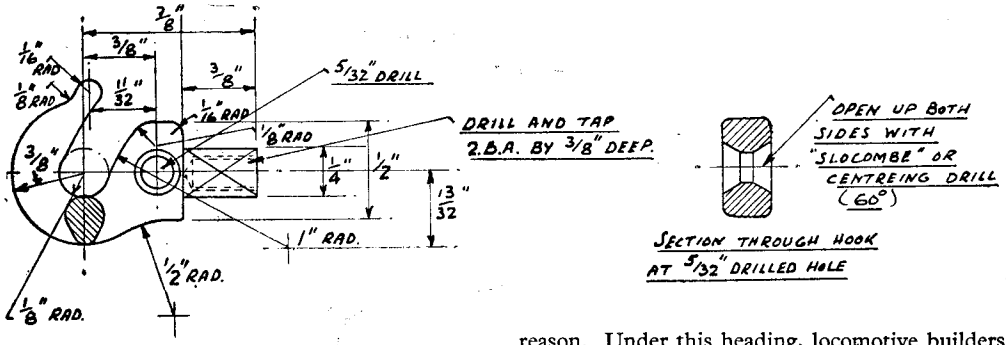




One other item affected, in the event of $4\frac{3}{4}$-in. gauge being adopted, is the brake hanger bracket. The drawing shows a gap of $\frac{1}{2}$ in. inside the fitting, and this should be reduced to $\frac{3}{8}$ in. for the lesser gauge. There are six of these brackets to make, all the same in the blank form, but bent up three in one direction and three in the other—in other words, handed right and left.

The drawing giving the drilling of the frames, shows the hole provided for the centre working pin, and once the brackets have been made, this pin may be used to locate them whilst the two smaller rivet holes are put through the frames, which should not necessitate dismantling of the frames, as the operation can be carried out with a hand or portable electric drill. Make sure the backs of the brackets are quite vertical, and all face the front of the engine.

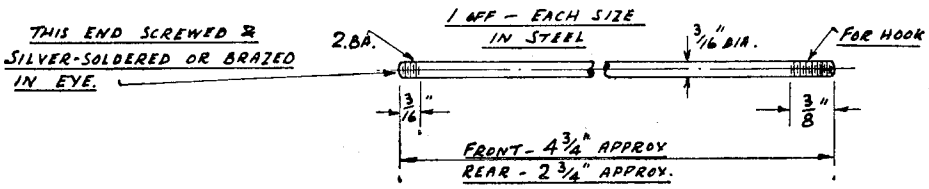
The pins are shouldered, with a $\frac{3}{16}$ in. by 40 thread on the turned-down portion, but 2.B.A.

would do equally as well. The shouldering of the pin enables it to be bolted up tight without collapsing the bracket. Those who like to study very minute and accurate detail will notice that provision has been made for a tiny check pin alongside the main pin hole, and comprises a short piece of rod threaded 10-B.A., and screwed into the bracket to leave about 1/32 in. of plain




portion projecting. The little peg should be finished flush inside the bracket, and a very few minutes with a small round file will produce corresponding " nicks " in the heads of the main pins to suit. Apart from an improved appearance outside, these pegs do, in fact, perform a job of work by preventing turning when tightening up the nut at the back, so their inclusion is again justified.

Moving on a stage further, the making of the springs is a job that can be done with little more than the removal of the wheels for the time being. But here I want to mention a most important point : on the prototype the leading and driving axles are on leaf-springs inside the frames, and with the springs resting on top of the axleboxes,




and hangers reaching down from both ends to brackets on the frames. The trailing axle is fitted with a form of equalising beam under the axlebox, the two ends of which engage forked rods carrying coil springs, and a means of giving screw adjustment for tension. On both " Major " and " Minor " the fitting of almost the exact replica of the whole springing system has proved to be so simple and straightforward, that I have abandoned the idea of describing any other type. Not only that, the system adopted is perfectly efficient in every way, and the fitting of any other makeshift method I would regard as *pure laziness, or lack of sufficient interest in the job.*

I have been given praise for my detail work—why ? Because I insist upon careful attention to details, and with emphasis on *working details*, and by that I do not mean details that might be made to work, but seldom do. I mean details *designed to work, and go on working*, even if an occasional outsize bolt is absolutely necessary for reasons of practicability, or some such solid reason. Under this heading, locomotive builders are beginning to learn that suitability of material *is* quite an important point in competitive work, and it is the competitive side of the activity that has and is doing so much to keep and improve the general standard of workmanship.

On the other hand, I have been accused of using stainless-steel where it is not found on the prototype, but since when has sheet brass been used for tender sides in full-size practice ?

Come now, let us all be reasonable, and select and use the materials that best satisfy accurate appearances, scale strength and common-sense service conditions. I will not condemn the man who uses brass for water tanks or tenders, and I shall use it myself. In the same way I shall not only use stainless-steel for all parts that good sense demands should be permanently free from the risk of rusting, but I shall continue to advise its adoption in an ever-increasing range of components. To let some chance oil mist do the work of protection, may be all very well for some folk, but it just isn't good enough for me.

I have made one alteration regarding the fixing of the master spring leaves to their hangers, due to the fact that full-size springs of this type have solid forged ends. This is just one of the cases where the scale thickness does not permit of similar treatment, so the design is altered to that of pierced blade ends.

I do not think the appearance of the assembly is altered one little bit ; in fact, it might be an improvement. Anyhow, it does make the job a simple one, and all you will require is a dead-flat punch, almost glass hard, and a block of lead,

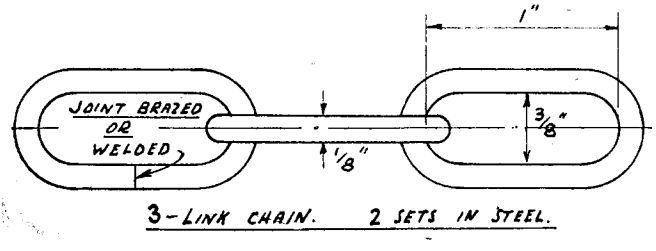
not too much like Gruyere cheese. It is important to see that the punch end is (a) truly round ; (b) parallel for at least ⅛ in. of its working diameter, if not slightly tapered *in* as it goes up ; (c) either dead hard or, if made in silver-steel, let down to the very palest straw colour. As I have said, the lead block must have some flat surfaces left on its poor, ill-treated body, and if not very much in bulk, should be backed up by some other solid mass, like an anvil or a large off-cut of steel bar. Rest this lot on a stone floor rather than on a light bench top. Rest the spring steel strips on the lead block, one at a time, and marked where the hole is required. Hold the punch firmly and upright in the hand and hit it (the punch, not the hand) with a fairly substantial hammer.

One good blow should be enough when it will be observed that a perfectly clean hole is left in the steel. The alternative to this method, and one that I have used with very great success, may cause a trade scandal. I use a " Juneero " all-purpose tool, in spite of the maker's warning inside the box, to the effect that only the special steel supplied may be worked on. I think it is a great tribute to the sturdy design and construction of this little tool, that it has stood up so well to such outright abuse for so long, and looks like doing so for ever more. If I broke it tomorrow, I would have had a very good twenty-five shillingsworth, which is all it cost me that time ago. The only disadvantage lies in its inability to produce more than one size of hole, and I have to admit to designing my bits and pieces round the capacity of the punch, unless the holes required come well beyond the range, when I resort to the former method described.

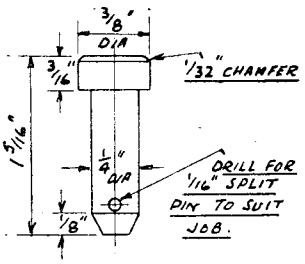
The steel used for the spring leaves is ordinary clock-spring, ⅜ in. wide exactly, and quite a standard size, whilst the gauge seems to vary from 20 to 22, either of these being applicable in this case, although the use of the former may necessitate a few less leaves in the smaller blades.

The leaves, when completed and made up into their respective sets, are housed in a buckle as shown on the drawing.

This might also be made in the form of a full, closed box-buckle, except that unless the leaves fit really tightly into it, much of the effectiveness of the spring is lost. By this I mean that, for a given load, a larger number of leaves are required in a " loose box " than in an open box with a substantial clamping-bolt as drawn ; although the arrangement does not look very exciting on paper, I can vouch for its good looks, and the retention of that subtle quality known as " damping " which somehow seems to get lost in the loose-fixing type. The effect of this damping (for want of a better word) is quite extraordinary in that it appears to reduce wheel slip. So often have I noticed the welcome effect that I am obliged to catalogue the knowledge as a well-established fact, adding the rider " reason not entirely understood."



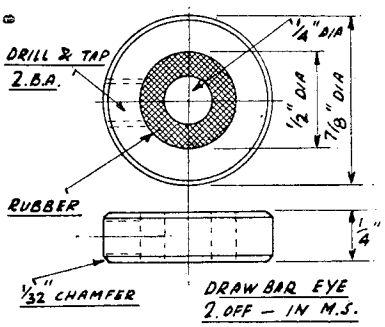
3-LINK CHAIN. 2 SETS IN STEEL.



2 OFF — IN STEEL.

Carrying out a promise I made, that advance information would be given regarding materials called up for future jobs, and just in case the whole drawing of the spring system cannot appear with this issue, due to space considerations, here are the main items :—For the spring hanger brackets, a piece of extruded brass bar, 1 in. × ⅝ in. × 3½ in. long will make the eight parts required, or 1 in. × ¾ in. × 3½ in. long if in the form of cast gunmetal stick.

The equaliser-beams are available in the form of gunmetal castings, and two are required. Four coil compression springs, 1¼ in. to 1⅜ in. free length, by ⅜ in. o.d. by 17-gauge are needed,

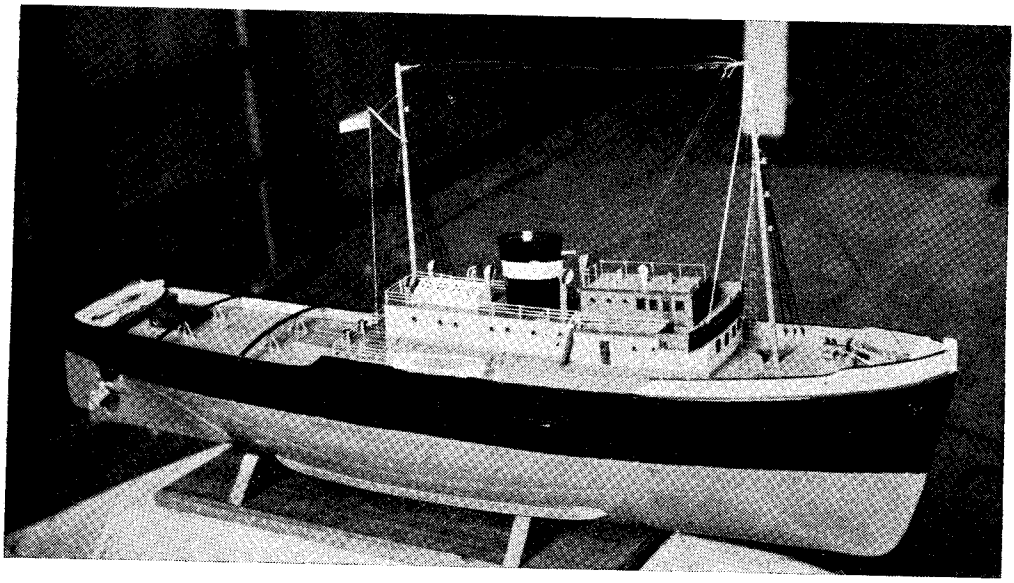



and mine were found in one of the " Terry " standard series of boxed springs, of the " Convenient " Series, No. 760 ; but, excellent as they are, it is a dear way of buying four springs out of a six-dozen assortment.

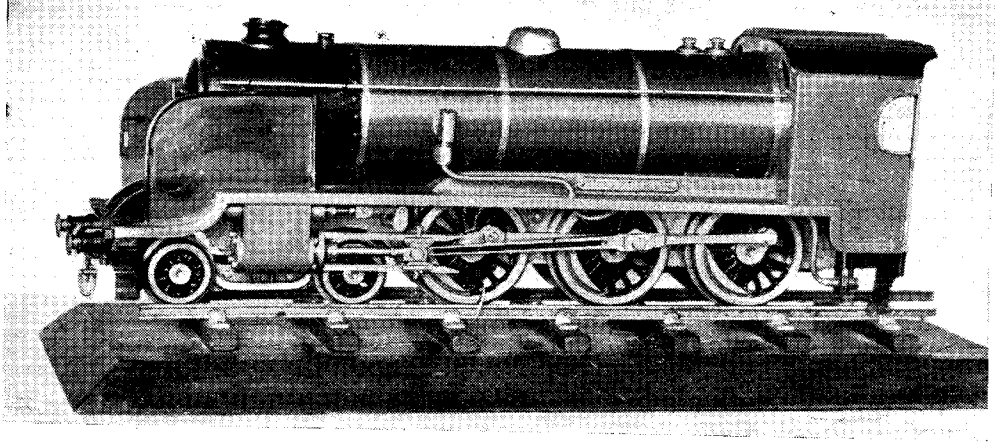
The rest of the parts might also be described as being *ex* the workshop scrapbox, there being nothing more than odd pieces of steel rod and brass off-cuts. Get the materials together, and a weekend will almost see the spring job at its end.

(*To be continued*)

# Falmouth's Second Exhibition



THE second exhibition of the Falmouth and District Model Club was held from August 8th-20th, the first week at Gyllyng Hall, and the last seven days in the Market Street. Despite a very hot spell of weather more than 2,000 people visited the show. There were over 150 models on view mainly consisting of power boats and yachts, as these are the strongest sections of the club. There were also aircraft, car, railway and miscellaneous exhibits. The finest item was a 30-in. model of the salvage tug *Zwarte Zee* in which great attention had been paid to small details and which had a very fine finish. Another model worthy of mention was a steam "O"-gauge locomotive of the Southern "King Arthur" class, not completed. This club, which was formed in April, 1948, has had a rapid expansion and now have ninety-odd members.



# The Technique of Good Drilling

## Things the model engineer should know in order to avoid trouble

by J. W. Tomlinson

IT can be said without fear of contradiction that the drill is one of the most used tools in the working of metals. It can also be said that when the drill is not used intelligently it can cause a lot of trouble. The usefulness of the drill can be understood when it is realised that almost every major part of an engine has to be drilled. With these points in view, a few notes on the technique of drilling will not be out of place.

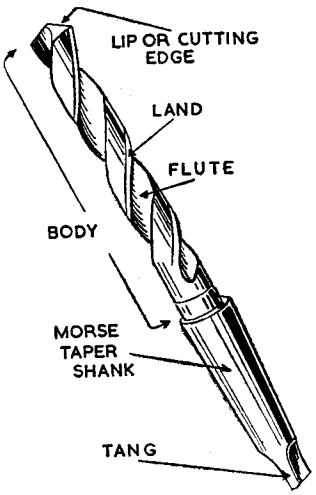



*Fig. 1. The main features of a twist drill*

### Types of Drills

Drills are made for every purpose, and while it is not suggested that the model engineer acquires all these types, a review of the more popular kinds will help in making a suitable selection.

The twist drill can claim to be by far the most popular, and among this type there are many varieties. There are twist drills with two, three, and four flutes for drilling different kinds of metal, and all these can be obtained with straight, taper, and square shanks for use in a chuck, taper machine socket, or in a hand ratchet appliance. The main features of a twist drill are shown in Fig. 1.

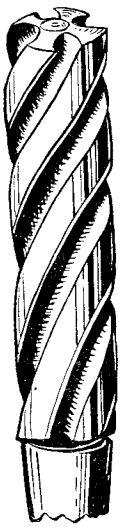


*Fig. 2. A four-fluted drill used for boring out rough core holes in castings*

Another variation is in the type of steel from which the drill is made. For high speed and arduous work, such as the drilling of manganese and stainless-steels, high speed steel is used, and for ordinary jobs such as the drilling of mild-steel and other soft metals, a high grade carbon-steel is used. Again the helix of the flutes is varied to suit the different materials to be drilled; for instance, a very slow spiral is for plastics and a quick or close pitch is used on aluminium. These drills are, of course, classed as special-purpose drills, and for all general work the helix remains standard.

Most of these drills contain two flutes, but for the drilling of rough core holes in castings, a three- or four-fluted drill should be used, (see Fig. 2). This type of drill has no point, and due to its rigidity through having extra flutes, it will stand up to the harsh treatment dealt to it in drilling out such rough holes. For drilling small holes up to $\frac{3}{8}$ in., straight-shank drills are generally used. These are

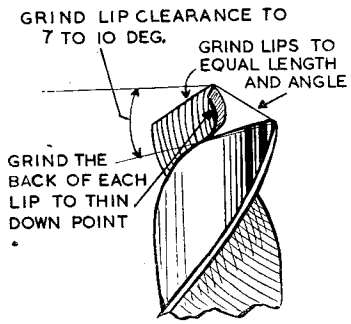



*Fig. 3. Important points in drill grinding. Point thinning may not always be necessary*

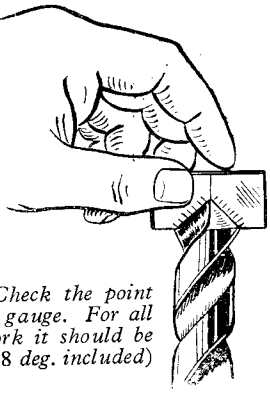


*Fig. 4. Check the point angle with gauge. For all general work it should be 59 deg. (118 deg. included)*

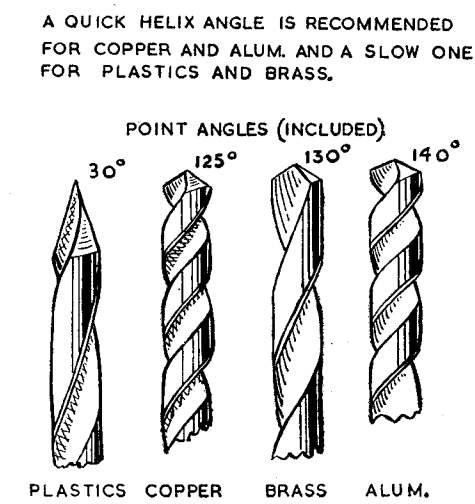



*Fig. 5. Some point and flute helix angles employed for different materials*

more economical to manufacture and usually quite suitable for the job they have to do. Taper-shank drills are used for the larger sizes, the work being done either in a drilling machine or a lathe. The shank is a standard Morse taper and when used correctly, the alignment of the drill is very accurate. It is essential when using this type of drill, that the shank and socket are perfectly clean and free from oil and grease. Drills having a square shank are for use with a ratchet lever and jack. This appliance is used in constricted places where it is not possible to use other equipment, and is generally seen on heavy constructional work.

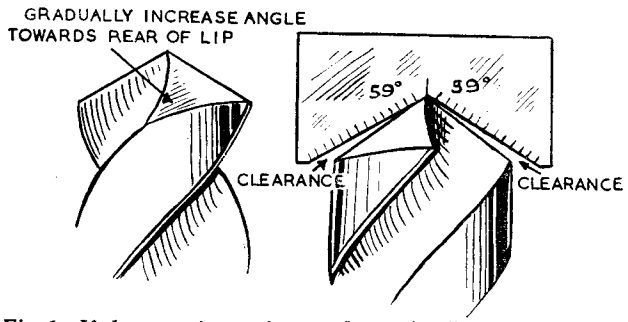



*Fig. 6. If clearance is not given to the cutting lips, the drill will rub instead of cut*

## Sharpening of Drills

Having dealt with the different types of drills, the next item of importance is the sharpening. A badly sharpened drill can cause breakages, spoilt work, overheating and loss of temper, and bearing this in mind, it is recommended that where the model engineer is not experienced, he should periodically have all his drills machine sharpened. Tool stores having these drill-sharpening machines will sharpen drills in a jiffy for a few coppers, and one is then assured of a period of trouble-free drilling.

If the model engineer feels competent in carrying out the grinding himself, the following notes should be of some help. The most important points to watch when drill-grinding are shown in Fig. 3, and these are the point angle, the lip clearance, the lips identical and the point thinned. The point angle will vary according to the work to be done. For all general work the standard recommended angle is 59 deg. from the axis, that is a 118 deg. included angle, this should be checked with a gauge, as shown in Fig. 4. A fine grit wheel should be used and light pressure applied with ample supply of water. If it is not convenient to have the water running on to the wheel, it is better to grind dry. When grinding dry, short periods of contact should be employed to avoid overheating. If the drill inadvertently gets overheated, allow it to cool off slowly. Dipping it in water will cause small grinding cracks which may ruin the drill. Some typical point angles are shown in Fig. 5.

The lip clearance on a drill is similar to the rake on a lathe tool, it is there to enable the tool to penetrate into the work-piece. If no clearance is given, the drill will simply rub, and if too much clearance is allowed, the lips will chip along the cutting edge. The recommended lip clearance for all general purposes is 7 to 10 deg. The clearance angle should gradually increase towards the back of the lips as shown in Fig. 6. It is of great importance, when grinding this clearance, that the lips are of equal length and cone angle, otherwise the point will be off centre, putting excessive strain on the machine and the drill, and producing an inaccurate and oversize hole. If when using the drill, it is noticed that one flute is producing all the chips, it is an indication that the lips have been ground to different angles, the machine should be stopped, the drill examined and re-ground.

It will be noticed that the point on

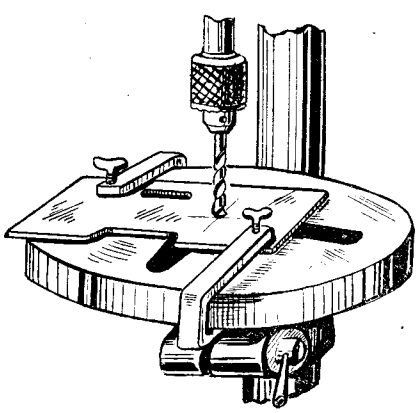


*Fig. 7. Clamps should be used. This will avoid damage to fingers caused by work-piece spinning*

a new drill, is really a good point, but as the drill gets shorter, the point turns more into a chisel edge. This is due to the thickness of the web, that is, the centre of the flukes, getting thicker towards the shank. When this occurs, the point should be thinned down by grinding, as shown in Fig. 3. It is most important that the thinning is equal on both lips, and that the point is left central with the axis of the drill.

### The Drill in Use

For accurate work, drills should be treated with as much care as are reamers and other fine cutting tools. They should not be jumbled together in a box but arranged in an appropriately drilled block of wood. Neither should the point be struck with anything harder than a piece of lead when fixing in the machine socket. The practice of forcing the point against the machine bed is also bad.

When using a taper shank drill, to avoid the possibility of the drill being pulled out of the socket as it breaks through the material, the inside of the socket and the drill shank, should be perfectly dry. Although very good holes can be made by drilling slightly undersize and finishing off with a new drill cutting dead size, theoretically, a twist drill will not drill an absolutely round hole. If this amount of accuracy is required, the final cut must be made with a reamer.

All work, and especially thin sheet material, should be clamped down when using a machine. This will prevent damage to fingers, the machine and the drill. The drill point should be lowered on to the work-piece before the power is switched on. If the drill starts to " weave " it is a sure sign that the drill has been ground off centre. Awkward shapes can generally be held in a machine vice, and a good tip when drilling small holes at an angle which break through into a larger hole, is to fill the larger hole with a low melting point metal such as " Cerrobend," as shown in Fig. 8. Such holes as these occur occasionally in oil and fuel passages and there is always the risk of the drill breaking as it " hogs " through into the larger hole. The soft metal will provide a " bite " and prevent the drill breaking. The metal is afterwards melted out in hot water.

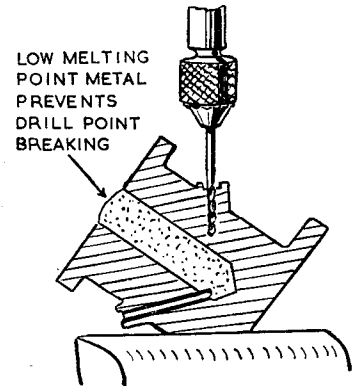



*Fig. 8. When drilling at an angle into a large hole, less breakages will occur if large hole is filled with " Cerrobend "*

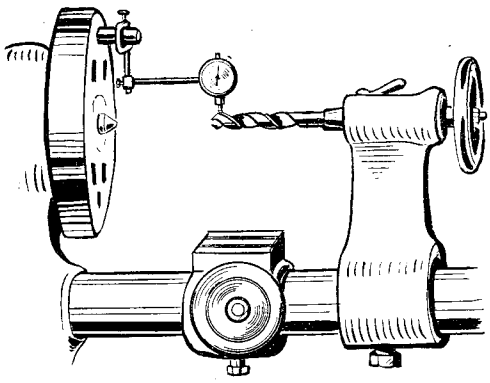


*Fig. 9. A simple method of checking the alignment of the drill when fitted to a lathe tailstock*

### Drilling in the Lathe

It is usual when drilling in a lathe to use a chuck or socket fitted into the tailstock. It often happens that the work-piece is important and the hole is to be dead accurate. This accuracy can only be obtained when the drill is correctly ground and in perfect alignment with the lathe mandrel. A simple way of checking the alignment is shown in Fig. 9. A dial indicator is mounted on the lathe mandrel with the dial button contacting a land on the front end of the drill. The mandrel is then rotated to bring the dial button on to the other land on the drill, and dial readings noted. The same check is then made at the shank end of the drill by closing in the tailstock. If the drill is out of alignment, it should be removed and the shank and the socket examined for burrs and swarf.

| | |
|---|---|
| MILD-STEEL | SOLUBLE OR LARD OIL |
| CAST-STEEL | LARD OIL |
| TOOL-STEEL | LARD OIL |
| AUSTENITIC-STEEL | SOLUBLE OIL |
| STAINLESS-STEEL | SOLUBLE OIL |
| MANGANESE-STEEL | DRY |
| CAST-IRON | DRY |
| MALLEABLE-IRON | SOLUBLE OIL |
| WROUGHT-IRON | LARD OIL |
| BRASS | DRY OR PARAFFIN |
| ALUMINIUM | PARAFFIN |
| DROP-FORGINGS | LARD OIL |

*Table of drilling lubricants*

It should be borne in mind, when drilling in an ordinary small lathe, that the tailstock is not made to withstand such heavy thrusts as would occur when drilling large holes. Therefore, if a lot of heavy work is to be done, it is suggested that a special type of tailstock is used incorporating a thrust bearing.

(*Continued on page 411*)

# The Grand Regatta

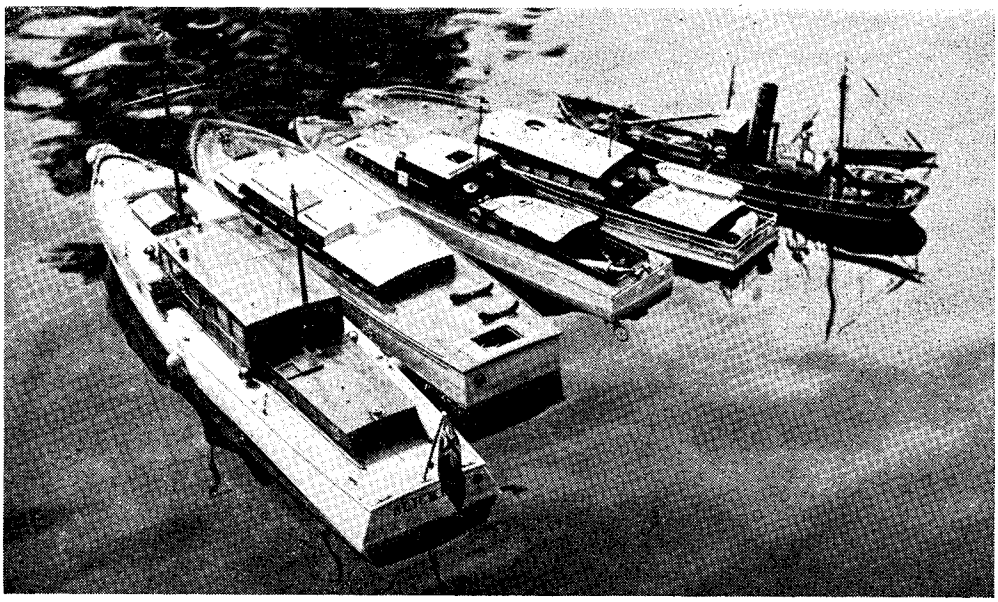
*Mr. Maclellan, of the West London club, with his drifter "Caroline," winner of the Prototype Cup*

THE Grand Regatta of the Model Power Boat Association is an event that is always well supported, but this year's event must surely be the most impressive model power boat meeting ever held in this country.

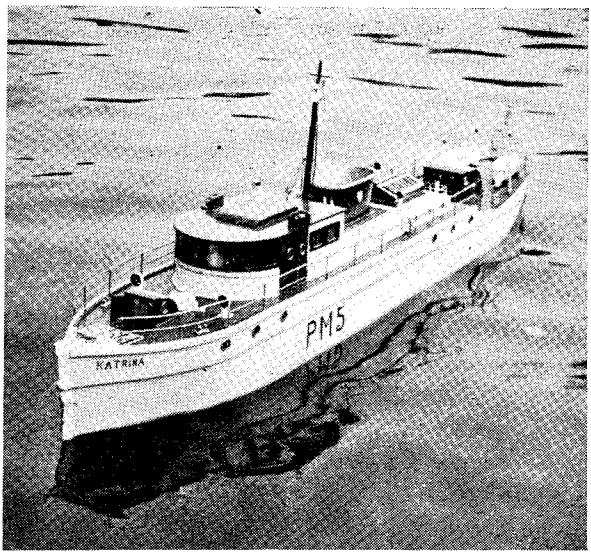
For many years the "Grand" has followed the close of THE MODEL ENGINEER Exhibition, and thus the date this year was Sunday, August 28th The regatta was timed to commence at 11 a.m. but well before this, competitors and spectators arrived at Victoria Park in large numbers, including coachloads from Bedford, Portsmouth, Coventry and Southend. The weather was good and though we had no rain, it was not *too* hot, and thanks to the efforts of the M.P.B.A. officials and the co-operation of the competitors a heavy programme was successfully completed in reasonable time, the regatta ending at 6.15 p.m.

To give some idea of the task of the stewards and timekeepers, there were some 60 boats in the nomination and steering events alone—plus over 30 racing boats in the various speed classes!

The huge crowd of spectators who remained at the pondside all day were well rewarded. Almost every conceivable type of boat was seen in action—battleships, tugs, liners, trawlers, launches, racing hydroplanes, paddle steamers,



*A group of prototype boats at their moorings*




*Mr. Ford's steam yacht "Katrina," from the Portsmouth club*

flash steamers and what-have-you. There were thrills in plenty, too, the Class "B" record being broken twice during the day, once during the regatta itself and the second time after the prize-giving, on a special attempt. This fine performance was by F. Jutton with his flash steamer, *Vesta II.*

The regatta opened with a 70-yd. nomination race for the free-running boats and promptly to time the first boat was away down the course—to be followed by others in non-stop procession. Many of these craft were making their first appearance at Victoria Park and caused great interest. The large size of some of the Portsmouth boats was noted with much attention. As can be imagined, with 60 boats competing, nominations had to be almost dead-on to stand a chance of a place, and the winner, Mr. Eltridge (Victoria), with his fine paddle steamer *Crested Eagle* was only 0.5 sec. out in a nomination of 70 sec. The general reliability and running of all the boats was very good, only a few boats failing to finish the course.

**Result :—**

1st—Mr. Eltridge (Victoria), *Crested Eagle*, nom. time 70 sec., act. time 69.5 sec., error 0.71 per cent.
2nd—Mr. Mitchell (Victoria), *Glen Helan*, nom. time 21 sec., act. time 20.8 sec., error 0.9 per cent.
3rd—Mr. Ford (Portsmouth), *Katrina*, nom. time 47 sec., act. time 46.2 sec., error 1.7 per cent.

Next on the programme were two speed events for the "C" Restricted and "B" Classes, both over 500 yd. The first of these, the "C" Restricted Race produced ten competitors, and a light line was used at first for the small boats of the Kingsmere Club, but only one of the three boats from this club managed to complete the course ; Mr. Walton's new boat, however, made a spectacular show, but appeared very unstable.

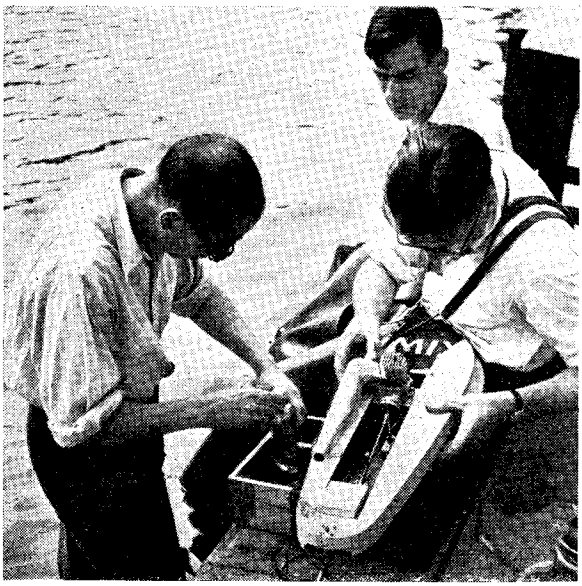
Of the 10 c.c. boats, Messrs. Stone (S. London), Brearley (Derby), Phillips (S. London) and Geary (Victoria), all recorded a time for the 500 yd. on the first runs, but on the second "round" Mr. Kington (Bristol) with *Kiwi* made up for not completing, by recording a time of 21.65 sec., 47.2 m.p.h., a fine performance ! Mr. Phillips's boat petered out on his second try, while Mr. Brearley bettered his speed with *Bitza II* to 37.1 m.p.h.

**Result :—**

1st—Mr. G. Kington (Bristol), *Kiwi*, 21.65 sec., 47.2 m.p.h.
2nd—Mr. Phillips (S. London), 25 sec., 40.8 m.p.h.
3rd—Mr. Brearley (Derby), *Bitza II*, 27.55 sec., 37.1 m.p.h.

The Mears Trophy race for the "B" Class boats followed on immediately, and first on the line was Mr. Collins (Victoria) with *Sharkie*, unfortunately Mr. Collins's boat failed to continue running on two "releases," this counting as one "run."

Mr. Mitchell (Runcorn) was next with *Beta II*, but, most unusually, failed to complete the distance. Mr. Lines (Orpington) made a good run with *Sparky* at 39.2 m.p.h., but the next



*Mr. Kington, of the Bristol club, with his hydroplane, "Kiwi," winner of the "C" class (restricted) event*

competitor, Mr. F. Jutton, with *Vesta II*, gave an amazing performance, beating his own record in this class! His time was 21.35 sec., 48 m.p.h. Mr. Collins on his second run with *Sharkie*, did 40 m.p.h., but Mr. B. Mitchell's *Beta II* dived under at high speed. This is the first time that Mr. Mitchell has not managed to complete in a regatta. Mr. Jutton's flash steamer also had bad luck on the second run, slowing, and finally stopping on the 4th lap.

**Result :—**

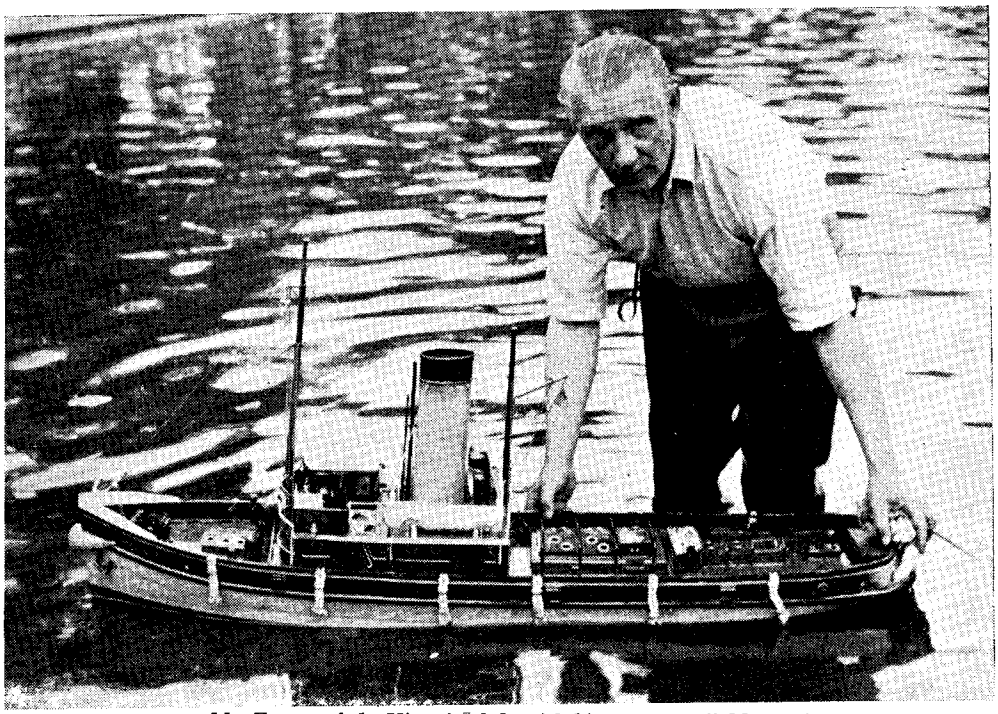
1st—Mr. F. Jutton (Guildford), *Vesta II*, 21.35 sec., 48 m.p.h.
2nd—Mr. Collins (Victoria), *Sharkie*, 25.5 sec., 40 m.p.h.
3rd—Mr. J. Lines (Orpington), *Sparky*, 26.05 sec., 39.2 m.p.h.

There being no time for a proper lunch interval, the programme continued with the Steering Competition, and this event, in spite of the huge number of boats contesting it, went off quite smoothly and without waste of time. It would be impossible to describe all the different craft in this event, but nearly all steered reasonably well. The winner was none other than "Bill" Butler of the W. London club, with *Mary Dean*, 13 pt., and he will hold the M.P.B.A. Steering Trophy for one year.

The runners-up included, Messrs. Rayman and Porter, 2nd and 3rd respectively who were followed by Mr. Curtis (S. London), 9 pt., Mr. Fastner (Kingsmere), 8, Mr. Vanner (Victoria), 9, Mr. Walker (Malden), 8, Mr. Watts (S. London), 8, and Mr. Alcock (Victoria), 8. Nearly all the boats hit the target at least once, and the result was in doubt right up to the last boat to run.

**Result :—**

1st—Mr. W. Butler (W. London), *Mary Dean*, 13 pt.



*Mr. Evans, of the Victoria club, with his steam tug "Maycock"*

2nd—Mr. A. Rayman (Blackheath), *Yvonne*, 11 pt.
3rd—Mr. R. Porter (Victoria), *Slickery*, 10 pt.

During the Steering and Nomination events, Mr. E. Bowness and an assistant were judging the Prototype Competition, and the winner was again Mr. Maclellan (W. London) with another steam drifter *Caroline*. Mr. Maclellan won this event last year with *Lady Betty*.

The Class "C" race for the Victory Cup followed, and in this race only Mr. Barnes' (Derby), ***Suna***, recorded a time on the first runs, out of seven competitors; Mr. Cruickshank's (Victoria) *Defiant III* capsized, as also did Mr. Clark's new boat. In the second runs, Mr. Benson's *Moth* made a good run at 38.2 m.p.h. and this speed was unbeaten at the finish; Mr. Barnes being lower on his second run with ***Suna***. The chief trouble with the boats in this class appears to be instability, although the engines seem to have plenty of "go" in them.

**Result :—**

1st—Mr. J. H. Benson (Blackheath), *Moth*, 26.75 sec., 38.2 m.p.h.

2nd—Mr. Barnes (Derby), *Suna*, 34.8 sec., 29.3 m.p.h.

The final event was the Speed Championship Cup race for Class " A " boats, and it is pleasant to record that there are no signs yet that the " A " Class is losing popularity. A welcome reappearance was made by Mr. A. Cockman's *Ifit V*, which with Mr. Pilliner's *Ginger* (Southampton), made two flash steamers in this race.

Mr. Pilliner was first on the line, but after a couple of laps at high speed, *Ginger* turned over ; the boat turning round the propeller ! Mr. Cockman put in two clean runs, the faster of the two being at 39 m.p.h. Mr. Miles (Malden), had two boats in this race, but withdrew a new two-stroke engined boat due to starting trouble ; his other boat *Barracuda II* ran well however, recording 48.4 m.p.h.

Mr. Williams (Bournville) made a good attempt to beat this, as also did Mr. Clifford (Victoria), but both just failed, and had to be content with places ; while Mr. Meagean (Altrincham), with *Samuel* was slower than usual.

**Result** :—

1st—Mr. B. Miles (Malden), *Barracuda II*, 21.2 sec., 48.4 m.p.h.

2nd—Mr. Clifford (Victoria), *Blue Streak*, 22.12 sec., 46.3 m.p.h.

3rd—Mr. K. Williams (Bournville), *Faro*, 22.5 sec., 45.4 m.p.h.

The Crebbin Trophy (awarded to the fastest flash steamer) again went to Mr. Jutton, for his speed of 48 m.p.h. in the Class " B " race.

After the prize giving, which was watched by a large number of spectators. Messrs. Mitchell and Jutton were allowed an attempt on the Class " B " record with official timing, and the day finished up with more thrills ; Mr. R. Mitchell's *Beta II* capsized at high speed, but Mr. Jutton had better fortune with *Vesta II* which also capsized, but not until it had done 51 m.p.h. for 5 laps, a new record, and the fastest officially timed speed for a flash steamer in any class ! This was a fitting end to an amazing day's sport. The clubs taking part in the regatta were : Bournville, Blackheath, Altrincham, Derby, Victoria, Swindon, Coventry, Portsmouth, Bedford, S. London, Orpington, W. London, Kingsmere, Malden, Bristol, Runcorn, Southampton, Enfield and District, and N. London.

---

# The Technique of Good Drilling

(*Continued from page* 407)

### Drilling Stainless and Austenitic Steels

Some difficulty may be experienced in drilling hard steels of the stainless types, and no doubt these metals can be difficult unless the necessary precautions are taken. For such hard metals, a standard high-speed drill is used, sharpened to a 59 deg. point. When marking-out, the centre punch should be used lightly, as the centre pop area becomes work-hardened and offers more resistance to the drill. Whenever possible a short drill should be used, the shorter the better, and the speed and feed should be regulated to keep the drill cutting. The recommended speed is half to two-thirds of that employed for drilling mild-steel. If the drill once ceases to cut, even for a second, the drill will rub and work-harden the metal, thus stopping the process. If this happens, the drill will have to be re-ground. When the drill is ground under these circumstances, it should be to a slightly different point angle, so that when it starts to cut it takes in only a portion of the hardened surface.

If the corners of the drill are rubbed off, the cutting speed has been too high, and if the cutting edges are chipped, the feed has been too heavy or the clearance angle on the lips is too great. Although some people prefer to use a lubricant, good holes can be cut dry. If hard spots are encountered, these can be got through with a spot of turpentine.

### Drilling Plastics

For drilling plastics containing abrasives such as slate dust, a first-class high-speed drill should be used having a slow helix on the flutes and ground to a sharp point (see Fig. 5). For the softer acrylic plastics, an ordinary drill can be used, and in each case the drilling should be done dry. The work-piece should be firmly clamped to a piece of wood so that the under side is not damaged when the drill breaks through.

### Drilling Thin Plates

To drill a round hole in a thin plate, it is most important that the drill is cutting its full diameter as it breaks through. This means that a drill with a very flat point must be employed. Such a drill will require much more thrust to make it penetrate, therefore, it should be assured that the point is properly thinned.

# Nothing to Grumble At!

## by "L.B.S.C."

PROBABLY "the voice" on the radio would say, with that inflection which irritates some folk and amuses others, "nothing at which to express disapproval"; but it all amounts to the same thing, viz. that a little garden railway can be made attractive instead of an eyesore. The reproduced photograph shows a garden railway put up some time ago by Mr. L. G. Fletcher, of Bickley, Kent. The arches are concrete, cast separately in a wooden mould, and erected on blocks of similar material. There is a removable section over the garden path; in the picture, the train is just passing over it. The track is multiple gauge, and the locomotive shown, is yet another "Juliet," belonging to a friend. The opinion has been expressed that "Maisie" was the most popular locomotive I ever described; but that is a rather rash assertion, because "Juliets" are something like Model T Ford cars ("tin lizzies") of the days before the Kaiser's war—wherever you go, you find them, even as far afield as Valparaiso, Chile. They are finished off to all sorts of outlines, American, Canadian, Continental, Colonial and so on, but the "works" and boiler are the same. The amount of castings and material sold by our "approved" advertisers is amazing. Incidentally, "Juliet" and "Juliette" (the gauge "1" sister) will form the subject of the second handbook, so there should be a lot more additions to the family!

*An asset to any garden!*

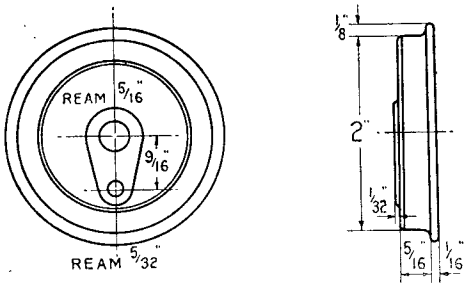
Anybody who cavilled at the appearance of Mr. Fletcher's "Bickley Light Railway" would indeed be hard to please. The thing to raise a fuss about is the brilliant tribute to the benefits and amenities of modern "civilisation," seen to the right of the big tree. Our own air-raid shelter is out of sight, being underground, and we use it for a coal cellar—that is, when we get any coal or coke to put in it. When I think of my happy childhood days, even though times were hard, and compare them with the present, honestly, I'm glad I'm on my way out. 'Nuff sed!

### Beginners' Corner—Wheels for "Tich"

As the coupled wheels for "Tich" are only 2 in. diameter, they can be turned on practically any average home-workshop lathe. They can easily be done even on a baby lathe of the "Adept" type, by rigging up a handle on the end of the mandrel. If you have nothing larger, and turn them thus, try to get a friend to act as "motor," so that you can concentrate on the actual turning. Some builders have managed to turn "Juliet" wheels on these tiny machines, using a handle, and going to work like a housewife or girl friend operating a hand-driven sewing machine; but it is much better to "see what toucan do," as the Guinness advertisements put it.

Since starting the notes on "Tich," I have received a considerable number of letters from absolutely raw beginners, asking for the fullest possible details regarding turning, fitting and so on; so maybe I'd better say a word here and now, about turning cast-iron. Incidentally, the next person who writes and tells me he has "got an itch to build a 'Tich'" stands a risk of finding somebody waiting beside his front gate with a tommy-gun—talk about great minds thinking alike!! Well, first of all, you need slow and even speed to turn the wheels; not faster than fifty revolutions per minute, at the outside. A back-geared lathe is very nearly essential, if the drive is by motor or treadle. The only satisfactory alternative is a small pulley on the driving shaft, and a big pulley on the lathe mandrel. Another thing very essential, is a good turning tool, preferably of high-speed steel, though you don't use it at high speed. This kind of steel gets under the skin of a casting much better than ordinary carbon steel, and lasts much

longer on one grinding. If you can get carbide-tungsten tipped tools, such as "Wimet" or similar brands, you will really be in the clover. With a "Wimet" tool, I can turn a 5-in. driving wheel tread on my Milnes lathe, in two cuts; one roughing and one finishing. Ordinary steel tools should have a fair amount of top rake, as the chippings come away much more easily.




*Coupled wheels for "Tich"*

### How to Drill the Wheels

The following method of machining wheel castings is one which I always use; it is fairly quick, easy, and what is most important, the wheels finish to exactly the same diameter without measuring each one. Coupled wheels *must* be the same diameter, otherwise one pair will be always slipping; and on a curve, where one side must of necessity slip a little, as the rails are of different lengths, you might have only one solitary wheel biting the railhead and taking the whole of the driving stress.

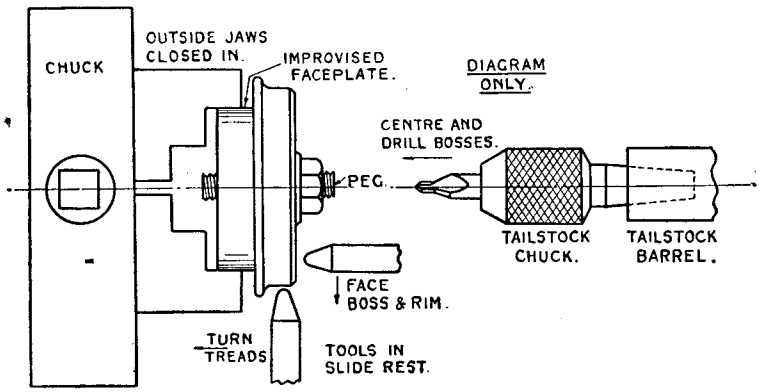
fit the tailstock barrel, is one of the most useful accessories one could have for any lathe. The most convenient size to get is one taking from 0-$\frac{3}{8}$ in. Run up the tailstock to the job, lock it to the bed by whatever means is provided on the lathe, then feed the centre-drill into the boss of the wheel, until it has penetrated to the end of the countersink; that is, the full diameter of the centre-drill. For this job, and the drilling and reaming to follow, run the lathe quite fast, with the belt on the smallest pulley, and feed the drills with the wheel or handle on the tailstock barrel.

Next, put a 19/64-in. drill in the tailstock chuck, and drill clean through the wheel boss. After that, put a $\frac{5}{16}$-in. parallel reamer in the chuck; and this time, instead of using the hand-wheel or handle, slack the tailstock locking nut, grip the tailstock bodily with both hands, and slide it along the bed, so that the reamer enters the hole to the full depth of the flutes. Then with the lathe still running the same way, pull it out again by sliding the tailstock back. You now have a hole truly in the middle, and dead to size required.

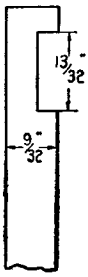
### How to Turn Backs and Rims

Put a round-nose tool crosswise in the slide-rest; then, with the lathe running at medium speed, face off the boss, starting with the tool in the reamed hole, and feeding toward you. Take a cut deep enough to clean the hard skin on the casting right off; if the cutting edge of the tool rubs on this hard skin, it is goodbye to the edge right away, and the tool will need regrinding before you do any more.

Now put the back gear in, if the lathe has one; if not, put the belt on the lowest speed; using the same tool, bring it back to the rim of the




*How to machine the wheels*




*Wheel thickness gauge*

If there is any moulding-sand sticking to the casting, brush it off with a wire brush; then chuck the wheel in the three-jaw, back outwards, gripping by the tread in the outside jaws of the chuck. Set it so that the back runs as truly as possible, and leave the flange clear of the jaws; just far enough away to allow the point of the turning tool to pass. Now put your tailstock chuck in the tailstock barrel, with a size A or B centre-drill in it. A tailstock chuck, which is just a small drill chuck with a taper shank to

wheel, and take a cut right across back of rim and flange, still feeding toward you, and getting under the skin of the casting. When you have cleaned it up, take a finishing cut at a little higher speed, right across the back of rim and flange, and boss as well, at the same setting of the tool, as rim and boss are flush at the back. Finally, turn the tool around and reset it at right-angles to the lathe bed; then take a cleaning-up cut over the edge of the flange, just sufficient to clean all the skin off. Mind you don't let the tool

run into the revolving chuck jaws, otherwise the tool, chuck, and even the machine itself might suffer serious damage.

Give the other three wheels a dose of the same medicine ; then reverse one of them in the chuck, gripping by the flange, and letting the turned back rest up hard against the chuck jaws. Now, with the tool set crosswise in the rest again, face off the boss until the distance from the back to the face of the boss, is 13/32 in. The easiest way for a beginner to gauge this is to cut a strip of metal a bare $\frac{5}{16}$ in. wide, which will just fit the reamed hole, and file a notch in it 13/32 in. long. Face off the boss until, when the gauge is put in the hole, the notch just goes over the thickness, as shown in the detail sketch. Young Curly used to make all sorts of " patent " gauges—you'd have laughed to see some of them, especially bent wire " calipers," but they all worked fine. I made two nobby pairs of adjustable calipers by filing up the legs from bits cut out of the discarded broken kitchen fender (the bottom plate of this was good steel of about 18-gauge) with two of the screws and nuts for pivots. There wasn't much of the old fender left when I had done with it ; the material it provided was of untold value to a poor kid who had to earn every copper.

Next, on the slow speed again, face off the rim, until the thickness of the wheel is $\frac{3}{8}$ in. overall. This can be gauged, either by a home-made one as mentioned above, or else by an ordinary slide-gauge, the jaws of which are previously set $\frac{3}{8}$ in. apart, as indicated by the scale. Face off all four wheels thus ; then, when the last one is still in the chuck, take out the round-nose tool, and put in a parting-tool. With this, still on low speed, cut a tiny rebate about $\frac{1}{16}$ in. wide and deep, at the inner edge of the rim, where the spokes would join the rim if the wheel had any spokes. This indicates the joint between the wheel and tyre, as illustrated in the issue for August 18th last.

**How to Turn the Treads**

The treads and flanges of the wheels are turned by mounting each wheel on an improvised faceplate. Anything circular, a little under 2 in. diameter, will do fine for this ; an iron disc, a discarded or spoilt wheel casting, an old chuck back, or anything similar. Chuck this in the three-jaw, and set it to run as truly as possible ; then centre and drill it, exactly as described for drilling the wheels, but use a drill to suit whatever $\frac{3}{8}$-in. tap you may possess. This would be 19/64 in. for $\frac{3}{8}$ in. Whitworth thread, $\frac{5}{16}$ in. for $\frac{3}{8}$ in. by 26, and so on. Then put a $\frac{3}{8}$-in. tap in the tailstock chuck, and tighten it well ; use a taper tap for preference. Run up the tailstock so that the tap enters the hole as far as it will go ; then pull the belt with your left hand, and push the tailstock toward the chuck with your right. The tap will then start to cut a true thread in the hole ; and by working the mandrel back and forth, by pulling first one side of the belt and then the other, you can get the tap to enter to its full depth. Note : cast-iron is drilled and tapped dry ; wrought iron or steel should be lubricated with cutting oil diluted with paraffin.

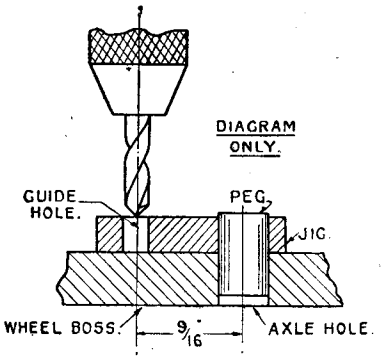
Next, with a round-nose tool set crosswise in the rest, face off the old wheel, disc or whatever it is you are using, exactly the same as the wheels were faced, starting from centre, and working outwards, running the lathe at slow speed. When faced truly all over, face out the centre, just 1/32 in. more, to a diameter of 1 in., so as to leave a little recess that size in the middle.

We now need a peg on which to mount the wheels ; so take a piece of $\frac{3}{8}$-in. round mild-steel, put it in the bench vice, and screw it down for about $\frac{1}{2}$ in. length, to the same pitch thread as the hole in the disc. This can be done with the stocks and dies in the usual way, a job so simple that it needs no describing ; but a better way still, for a raw recruit or a very inexperienced worker, would be to get a $\frac{3}{8}$-in. bolt about $1\frac{1}{2}$ in. long, or longer would do, provided that the threaded part is not more than about 1 in. long. Saw off either the piece of screwed rod, or the bolt, as the case may be, at $\frac{3}{4}$ in. from the end of the threads, and screw it as tightly as possible into the hole in the disc or wheel forming the improvised faceplate. Using a knife-tool, set in the rest so that it inclines a little toward the lathe mandrel, carefully turn the peg until the wheels will just slide on to it without shake ; then screw the end $\frac{5}{16}$ in. by 32 (or any other fine thread for which you may have a die and tap) leaving about $\frac{5}{16}$ in. of the peg plain. The screwing should be done with a die in the tailstock holder, as shown in the illustration. Most commercial tailstock die-holders have a taper shank, to fit in the hole in the tailstock barrel, but I prefer a parallel shank which can be held in the tailstock chuck, as it is quicker. My Boley lathe has a lever-operated tailstock, in addition to the ordinary screw pattern, and this has had a $\frac{3}{8}$-in. Jacobs type chuck attached to it for so long that I forget when it last came off ! I use this lathe for making all my boiler fittings, and other blobs and gadgets needing screwing and tapping, and the chuck has a sort of season-ticket on that job ! If you have no tailstock die-holder, purchase or make one at the earliest opportunity ; I made one of mine from a discarded cast-iron valve guide off a Tilling-Stevens bus engine, with a bit of a valve spindle for the stem—a bit of improvisation inherited from my childhood days. Meantime, the peg could be screwed by aid of the ordinary die-stock, same being applied carefully, and held as squarely as possible, whilst the lathe belt is pulled by hand.

You will need a nut to fit the peg ; well, get an ordinary $\frac{1}{4}$-in. nut, any thread, run a $\frac{1}{4}$-in. drill through it to clean the old thread out, and re-tap it to suit the threads on the peg.

*Don't remove the disc or old wheel " faceplate " under any circumstances after facing it truly,* but put a wheel on the peg, boss outwards, and tighten the nut. The friction between the back of the rim against the " faceplate," will be quite sufficient to drive the wheel around against the cutting tool. Use a round-nose tool with a rather pointed end. Running the lathe at slow speed, first turn the flange to $2\frac{1}{4}$ in. diameter. If the cross-slide has a " mike " collar, note the reading, and when turning the other three wheels, set it at the same number. If no collar, note the position of the handle, and turn the other flanges with the handle in same position. Then carefully

turn the tread to a shade over 2 in. diameter, again noting position of cross-slide collar or handle. The shape of the tool will attend to the contour of the flange; keep turning until the edge of the flange is $\frac{1}{16}$ in. wide. Treat the other three wheels in precisely the same manner; then, after the last one has been roughed out, take out the tool and re-grind it, or if it is not too bad (good grey cast-iron doesn't spoil the tool very much) maybe a few rubs on the oilstone will restore the keen edge. Replace it, and turn the last few thousandths off the wheel tread, to bring it to size. If it is a shade over, or under, it doesn't matter a bean, as the rest will be exactly the same. Now *don't shift the cross-slide handle*—very important, that!—just run the top slide back, and take off the wheel. Replace it by No. 2, take the finishing skim off that, ditto Nos. 3 and 4. As all four wheels are finished without shifting the cross-slide, they must of necessity all be exactly the same diameter on the tread.

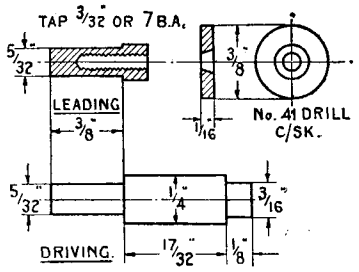



*How to drill crankpin holes*

After each one is turned, apply an old smooth file to the sharp edge of the tread, with the lathe still running, and hold it there until it has formed a little bevel or chamfer. Then apply it to the flange, rounding this off, as shown in the side view of the wheel. This point is very often entirely neglected, even among professional builders; not so long ago, I saw a 3½-in. gauge 4-6-0, costing well into a three-figure price, on which the flanges had been left with sharp edges, and had cut grooves in the boiler barrel and firebox wrapper. As the engine "bounced" on a road with undulations and bad joints, the excessive axlebox movement had enabled the flanges to touch the boiler.

It will be noticed that I have said nothing about tapering or coning the treads; they are left parallel. I have long since found out that it enables the engine to run more freely on curves, if the treads are parallel or cylindrical, especially in the case of a locomotive having six or more rigid wheels. All the Stroudley engines of the L.B. & S.C. Ry. had cylindrical treads to the driving wheels; and Sir William Stanier, when C.M.E. of the L.M.S., conducted a series of tests which proved very conclusively that the old idea of a 1 in 20 taper was a myth, after which the wheels of the engines were given just the weeniest bit of taper, merely sufficient to keep the flanges from rubbing on one side or the other, when the engine was on a straight line. On our little engine, the radius at the root of the flange, serves the same purpose.

Beginners should now know how to turn wheels, and the knowledge will come in useful for future jobs, as all kinds of wheels, bogie, pony,

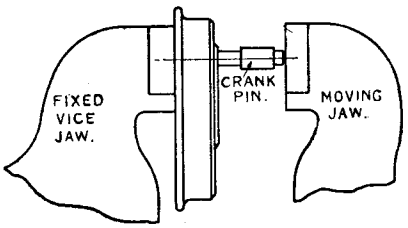



*Crankpins*

radial, tender, carriage and wagon wheels, may all be machined in similar manner. Don't on any account attempt to polish, or otherwise put a posh finish, on wheel treads; just leave them as finished by the tool. The slight roughness of the turned surfaces, affords the driving wheels a much better grip on the railheads; anyway, they wear smooth quickly enough, as they adapt themselves to the railheads in a very short time.

### How to Drill the Crankpin Holes

It is imperative that the holes for the crankpins carrying the coupling rods, should all be drilled exactly the same distance from the centre of the axle hole, otherwise the rods will bind, unless the holes in the coupling-rod bushes are drilled so large as to be "sloppy" Like everything else, the job is dead easy when you know how; all that is needed, is a simple drilling jig made in a few minutes. Get a piece of steel bar, say of ½ in. by ¼ in. section, and about 1¼ in. long. Scribe a line down the centre of this; and on the

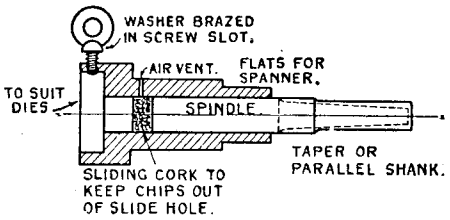



*How to press in the crankpins*

line, set out two points $\frac{9}{16}$ in. apart. Make a heavy centre-pop on each. Drill them both with 5/32-in. drill, as described for drilling axleboxes, using either lathe or drilling machine; hand-drilling won't be true enough. Open out one of the holes with a 19/64-in. or letter N drill. Next, chuck a piece of $\frac{5}{16}$-in. round steel rod in the three-jaw, and take a weeny skim off it with a round-nose tool, so that it just goes into the

reamed holes in the wheel bosses. Part off at about $\frac{5}{8}$ in. from the end. Rechuck this in the three-jaw, and turn down $\frac{1}{4}$ in. of the end until it will almost, but not quite, push into the larger hole in the piece of bar. With the lathe running fast, ease the end with a file, until it will just enter the hole for about $\frac{1}{16}$ in.; then remove from chuck, and squeeze it into the hole, using the bench vice as a press. The jig is then ready for use.

Scribe a line down the centre of each wheel boss. Insert the peg in the jig, into the hole in the boss, and adjust it so that you can see the scribed line passing across the bottom of the 5/32-in. hole in the jig. Clamp the jig in this position, by aid of a toolmaker's cramp such as was illustrated a few weeks ago; then poke the 5/32-in. drill down the hole in the jig, and drill right through the wheel boss. Repeat operation on the other wheels, and all the small holes can't help being exactly the same distance from the




*Home-made tailstock die-holder*

big ones. Use either a drilling machine, or the lathe, as before, because the crankpin holes *must* be dead square with the wheels; otherwise you'll never get the connecting- and coupling-rods to fit properly.

### Crankpins

The best material for the crankpins is silver-steel. The "natural" finish on commercial ground silver-steel enables pins made from it to run with a minimum of friction, and they resist wear to an extraordinary degree; especially if running in correctly-reamed bronze bushes. To make the leading wheel crankpins of "Tich," chuck a piece of $\frac{3}{16}$-in. round silver-steel truly in the three-jaw. If the chuck doesn't hold truly of its own accord, put a piece of thin foil, or even paper, between the steel and the offending jaw. Alternatively, you can use a split bush, which is equivalent in many respects to a collet chuck, and can be used an indefinite number of times. To make it, chuck a piece of $\frac{3}{8}$-in. round brass rod about $\frac{1}{2}$ in. long, in the three-jaw. Face the end, centre, drill it with an 11/64-in. or No. 16 drill, and ream it $\frac{3}{16}$ in. by exactly the same process as described above, for drilling and reaming the wheel bosses. Make a centre-dot on it, opposite No. 1 chuck jaw. Remove from chuck, and split it down one side with a fine hacksaw. Replace with dot opposite No. 1 jaw, in its original position; don't screw up the chuck jaws too tightly, but only enough to prevent it turning when the reamer is run through again to clean out any burr left by the saw. If the silver-steel is placed in the bush, and the chuck jaws tightened, the bush will grip the rod and hold it quite truly for turning.

With a knife-tool in the slide-rest, turn down $\frac{3}{8}$ in. length to a diameter of 5/32 in., which should be a tight press fit in the hole in the wheel boss. Now I've tried many ways of making this a soft job for any beginner, and I fancy the following is the best. With a 5/32-in. taper broach (you can get one at any tool stores) fixed in a small file or bradawl handle, broach the hole in the face of the boss, just the weeniest bit. Just take the merest scrape out of it, which will extend about $\frac{1}{8}$ in. into the hole. Now very carefully turn the spigot until it will just enter the broached part of the hole; it will then be a tight press fit for the rest.

Part off the steel at $\frac{1}{8}$ in. full from the shoulder; reverse, and grip in chuck by the turned part. Centre, and drill through with No. 48 drill; tap 3/32 in. or 7-B.A., guiding the tap by aid of tailstock chuck thus. Put a tap-wrench on the tap shank close to the threads; put the shank in the tailstock chuck, and close the jaws just tight enough to allow the tap to slide. Run the tailstock up to the job, enter the tap in the hole, and work the lathe belt back and forth by left hand, whilst you hold the tap-wrench with your right. Use cutting oil for turning, drilling and tapping. If the tap shows signs of jamming, withdraw it and brush off all chippings. Choked flutes break taps.

For the washer, just chuck a piece of $\frac{3}{8}$-in. round mild-steel in three-jaw, and take a 1/64-in. skim off it. Centre, drill down about $\frac{3}{8}$ in. with No. 41 drill; countersink the hole with 5/32-in. or No. 20 drill, and part off a $\frac{1}{16}$-in. slice. Repeat countersink and parting for second washer.

For the driving crankpins, chuck a piece of $\frac{1}{4}$-in. round silver-steel, making a $\frac{1}{4}$-in. split bush if necessary, to hold it truly. Turn a $\frac{3}{8}$-in. by 5/32-in. spigot as above, then part off at a bare $\frac{11}{16}$ in. from the shoulder. Reverse in chuck, face the end, and turn down $\frac{1}{8}$ in. length to $\frac{3}{16}$ in. diameter, using a piece of steel with a $\frac{3}{16}$-in. hole in it, for a gauge. The hole in this should be drilled No. 14, and reamed; and the turned pip on the end of the pin, should fit it very tightly.

The spigots can then be pressed home in the wheels by using the bench vice as a press. Warning, don't overdo the "Sunny Jim"; if the spigots are extra tight, ease them with a file very slightly, otherwise you will split the wheel bosses. Next stage, axles and erection.

### A "Slip Tip"

A reader complains of undue wear on the wheel treads of his flat car, due to slipping of one wheel on the fairly sharp curves of his railway, and seeks a simple remedy. This trouble can easily be overcome by the simple expedient of leaving one wheel free on each axle, putting a washer between it and the axlebox, to keep the gauge correct. This won't make the slightest difference to straight-line running, the ball-bearings taking the load in the usual way; but on the curves, the wheel will slip on the axle instead of the rail.

# *Traction Engines not so Well Known

## by Ronald H. Clark, A.M.I.Mech.E.

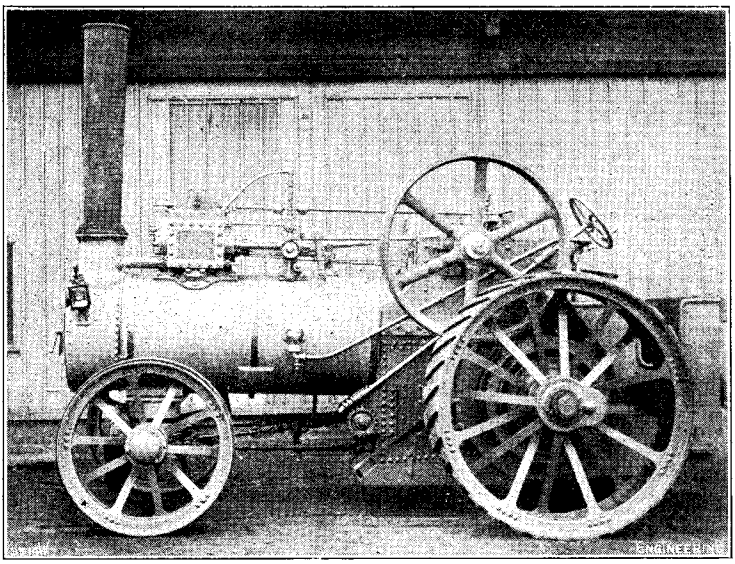


*Fig. 40. The unique annular compound showman's engine by Savages, of Lynn*

TEN years later, in 1894, saw the first showman's engine which was unique inasmuch as it was an annular compound machine. It was numbered 614, and a side view of it is included in Fig. 40 which shows it in a coat of grey paint ready for the photographer and without any showman's fittings. Apart from the most unusual arrangement of the cylinder-block, it was a standard three-shaft engine having extra-long brasses to all axles and was fitted with two speeds.

As this arrangement of compounding is so rare, I have prepared a drawing from data supplied by the makers, showing all details of the cylinders in Fig. 41. In this layout, the high-pressure cylinder is placed within the low-pressure, the dimensions being h.p. 6½ in. diameter, l.p. 14⅜ in. outside diameter × 8⅝ in. inside diameter × 12 in. stroke. Ratio of areas 3.03 to 1. The ports for the h.p. are cored in the cylinder end covers whilst those for the l.p. are cored in the usual way. With this arrangement there are five ports, one each end for the h.p. and l.p. respectively and the usual exhaust port in the centre. The slide-valve is hollow and the exhaust from the h.p. traverses back through the port and the valve, and thus into the l.p. at the other end. At the end of this stroke the exhaust takes place via the valve cavity in the normal manner. Note that a by-pass valve is fitted to the back of the slide-valve so that, in an emergency, high-pressure steam can be admitted to the l.p.

Three piston-rods are employed, one central for the h.p. and two diametrically opposite for the l.p. They unite on a common cross-head with a single connecting-rod to the crankshaft. Only one set of link-motion is required. W.p. was 140 p.s.i. This engine was supplied to the famous showman Jacob Studt and worked with the annular compound cylinders for 30 years until a spare cylinder block was required; but, as the makers had mislaid the patterns, an ordinary 8-n.h.p. single-cylinder block was substituted, and in this form this famous engine is still at work in Cambridgeshire, doing good work in agricultural pursuits. Fig. 41 should be studied in conjunction with Fig. 42 which is a photograph showing an erector's-eye view on the annular compound block—truly a unique view of a unique engine, and one not hitherto shown in the technical press.

The discerning reader will probably ask himself why manufacturers went to all this trouble to produce a compound engine with one crank when, a few years later, the double-crank compound layout became universal. The reason was one of public prejudice. Hitherto, the traction engine had always had a single cylinder (save a few with duplex cylinders) and the average agriculturalist was averse to buying something a bit more complicated than his ancestors had done; consequently, the compound took about fifteen years to become firmly established. The makers, being technicians, knew the economy of the compound over the

*Continued from page 355, "M.E.," September 15, 1949.

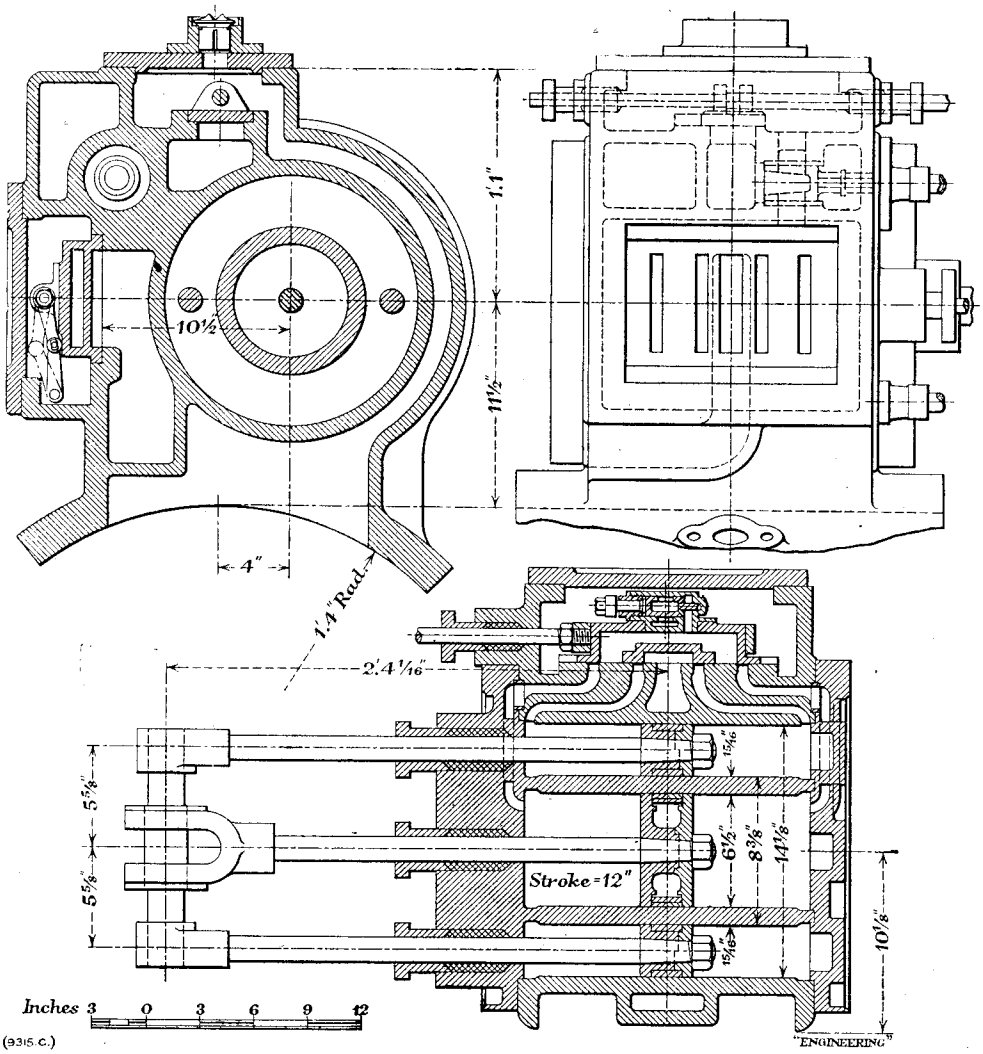



*Fig. 41. General arrangement of the annular compound cylinder block*

simple, and, to give the buying public the benefit of it, disguised the compound in these unusual guises. An exactly similar problem exists today in the motor-cycle field where certain manufacturers, to short-circuit the prejudice against the multi-cylinder engine, seek to disguise the twin as a single. For example, the new vertical twins which, I trust, do not hurt the tender susceptibilities of those to whom the ill-balanced single has been their only outlook for years.

But clever and interesting as the annular compound was, it was not a real commercial proposition, in competition with the double-crank compound type then coming in, and we find the next showman's engine to be the first of this make having side-by-side double-crank compound cylinders, the 7-n.h.p. engine in its showroom condition after leaving the paint shop being shown in Fig. 43. It was called *Empress*, the work's number being 730 and the date 1898. The cylinders were 6½ in. and 11¼ in. × 12 in., and it was equipped with two speeds.

At about the centre of the boiler, and riveted to it, are a pair of vertical plates with the centre portions cut away and braced together at the top by a square horizontal plate containing the footstep bearing of the vertical mainshaft of the roundabout. The whole traction engine, therefore, formed the centre of the roundabout and is technically known as a " traction centre engine,"

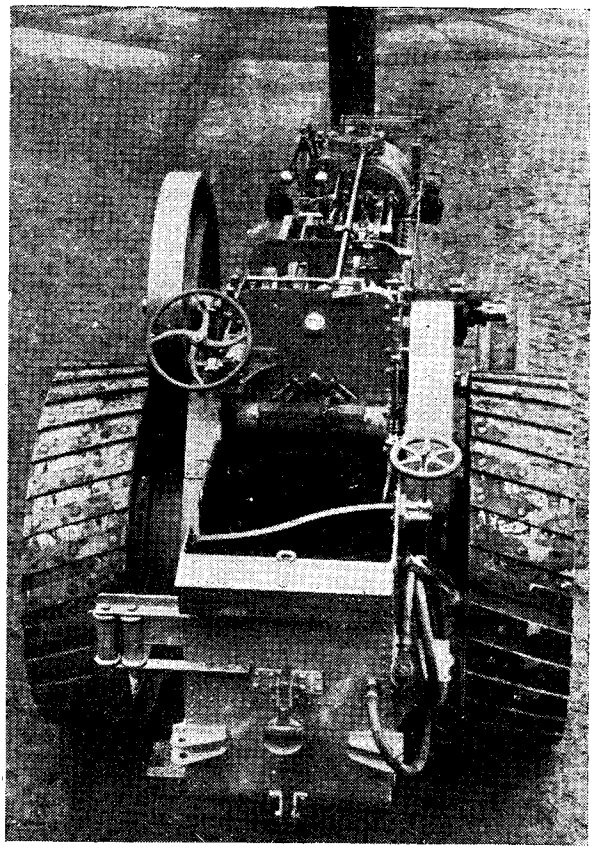
the type being originated by Savages. A smaller vertical shaft seen protruding above the canopy in Fig. 43 was bevel-driven off the crankshaft and carried a small pinion at the top which meshes with the large lantern or cradle-wheel when the last-named was erected on the main vertical centre spindle with the rest of the roundabout, in this particular instance a Gondola Switchback. The short vertical driving shaft could only be connected to the crankshaft (by bevel-drive and a dog-clutch) after the road gears had been slid into neutral, as all shift levers were interlocked.

*Empress* is equipped with a front bracket over and in front of the smokebox for carrying the organ engine. Later, a dynamo was always fitted for supplying light and power, the organ engine being attached to a suitable part of the organ or main engine.

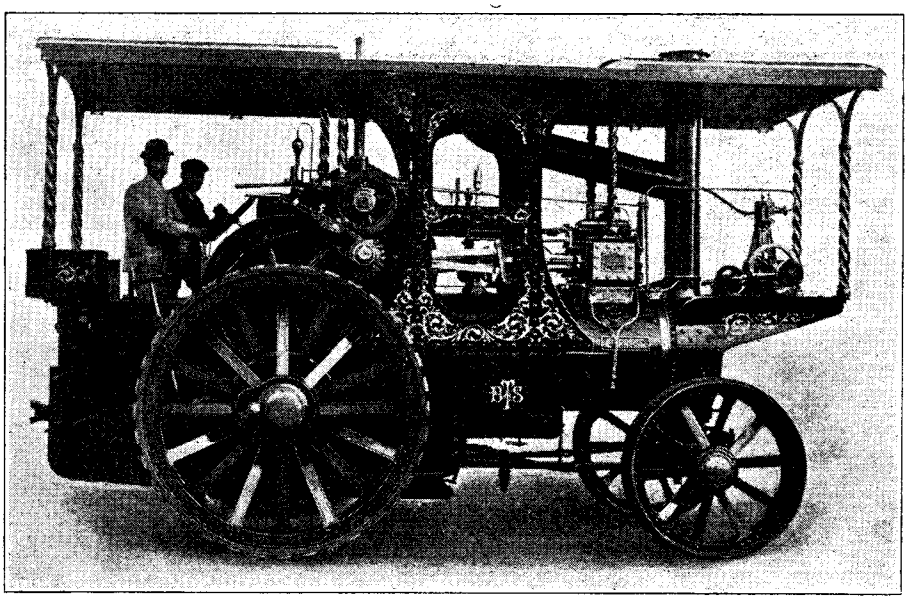
When in use as a traction centre, the chimney is covered at the top by a suitable plate, and the smoke and exhaust then travels via the inclined flue and finally through the hollow centre shaft of the roundabout and out at the very top. This inclined flue is clearly seen in Fig. 43.

This interesting engine was supplied to the now-defunct firm of Barker, Thurston & Sons.

*(To be continued)*



*Right—Fig. 42. Erector's eye-view on the annular compound motion*



*Below—Fig. 43. The first Savage double-crank compound showman's engine*

# *A Steward Looks at the Exhibition*

THE show on Tuesday morning before the opening day looks very different from what the visitor sees next day, and one's first thought is, that it will be a miracle if everything is ready in time. Chaos and hammering reign in the hall, and all that can be seen of the wonderful show of competition models is a jumbled heap of packages piled in a little room which the head man is clamouring to get cleared pronto, as he wants to put a large safe there.

The stewards' first job is to unpack all the models and put them out in the space allotted—and, believe me, both jobs are tricky. Some exhibitors mark their cases clearly, indicating in colour each screw which need be undone, whilst inside the case the model is held securely by clamping devices, and you find neatly-drawn-up instructions for final removal and the re-erection of any parts stripped for transit.

Others again provide full instructions—and put them somewhere where they won't be found until the stewards have puzzled out the answer for themselves—and maybe got it wrong!

And there are those devout believers who put their trust in a little cardboard, paper and thin string, but mainly in an all-seeing and beneficent providence.

From the stewards' angle there is a lot to be said for the first category. Nothing is more distressing than to find a nice bit of work damaged on arrival. You know just how you would feel about it yourself—and on a lower plane of thought, it is far easier to find and repack a well-made case than to trace a bundle of cardboard, paper and string.

During the day, many exhibitors bring in their models themselves, and this affords the stewards—if not too rushed—a welcome opportunity of chatting with them and obtaining extra information which will help to satisfy interested visitors.

By the end of the day, we have got almost everything set out on the stands, in pretty well all the wrong places. Some one *must* have more room for his overcrowded section—and so the others have to reshuffle and close up. Then the set-up fails to please the eye and must be re-arranged. Later come the judges, and you find that you haven't got the winning models where they can be seen to the best advantage—and you rearrange again. There is so much to do that you don't notice that around you the miracle has indeed been worked, and yesterday's chaos has become an ordered array of fascinating stands, and the heaps of debris transformed into the circular track and the S.M.E.E. railway.

A good many exhibitors drop in before the show opens, and this, again, affords a chance for many interesting chats with them. Then after the formal opening, the gates let in the flood. The first wave almost always consists of small boys who rush to the first stand they see. They don't stay long. Something else catches their eye, and they streak off as quickly as they came.

The people who make the show worth while for the stewards are the genuine model engineers. It is a great pleasure to talk to them and find out what they are interested in, and one only hopes that one has done something to help them to enjoy the show, and to see to the best advantage the things they came to view. I wonder if all "M.E." visitors realise that, if they will but ask, the stewards are only too delighted to help them to examine a particular exhibit.

This "seeing" business is indeed a problem. All the very small exhibits go perforce into one of the glass cases—though they can be taken out for close examination—and with the others it is a difficult compromise between enabling the connoisseur to see well enough and making it not too easy for small hands to touch. Seeing alone never quite satisfies a child—it has to touch as well—and I feel a strong sneaking sympathy with this desire, although I do not usually synchronise its satisfaction with the eating of a very part-worn apple or pear! The man who finds the solution will be a benefactor to the human race in general, and exhibitors in particular.

Although you may be concerned with one special part of the exhibition, it is highly desirable to get around a good bit and find out where everything is, because you never know what you may be asked next. This year the four commonest questions were :—

"Where is—the smallest electric motor?"
—the model made entirely of matches?"
—model 'X' (which was taken away after the first few days—an embarrassing query)?"
—the (*deleted by editor*)"

Then there are the rarer types of visitor. The truculent gentleman who takes a cursory glance at the exhibits and says reproachfully: "You've got nothing here. We've got far better models up (or down) our way." (There are several good answers to this, but as he has come over a hundred miles to make this speech, none are worth using.) The exhibitor who knows he ought to have had a better award. And the more you listen and look and say little, the more you think how right the judges were.

The man with a fixed idea who thinks you ought to know all about it, and tells you in three volumes.

But it would be very hard to beat the man who gazed for quite a while upon the Championship loco—a grand piece of work weighing about 3 cwt.—and then remarked as one merely seeking confirmation of a fact universally accepted: "I suppose these are all just toys, Mister?"

Finally, the last evening comes and, one by one, exhibitors from distant parts come to claim their models, and the chief steward has to solve the difficult problem of avoiding inconvenience

(*Continued on page* 427)

# Exhibited by Juniors

## by Ian Bradley

THE entries for the junior section at this year's MODEL ENGINEER Exhibition were as numerous as in the previous years and showed a wide range of interest, but space does not permit detailed comment on all the exhibits, so this must be confined to those models which awarded the special prize given by the Coronet Tool Co.

The 2½ in. gauge model of an American Austerity locomotive gained for its builder, Mr. L. W. Warnett, a very highly commended diploma and the Chadbourn & Plant Special


*A model air-sea rescue launch by D. Lovett*

gained an award. As a whole, the class well maintained its quality of workmanship though none of the exhibits were up to the silver medal standard. In a class where the entries contain examples of practically everything it is possible to model, the judges are always in a difficulty, being unable to compare like with like. However, there was no hesitation in awarding the bronze medal to Mr. D. Lovett for his well finished model of an air-sea rescue launch, which has the authentic finish of the prototype, and has been prepared to be something more than a glass case model. These launches are a difficult job of woodwork, which, in this case, was nicely carried out with good attention to detail. In addition to the bronze medal, this exhibit was Prize. This exhibit is quite a creditable piece of work for a junior, as the type of locomotive which the exhibitor has chosen is by no means the most easy to make.

The only other locomotive to gain an award in this section was the "Rainhill" exhibited by Mr. A. F. Philpot. This appears to be to "L.B.S.C.'s." specification, but the tender has been modified. The workmanship as a whole was good, but the finish of the paintwork left a lot to be desired, for there were some noticeable "runs" on the boiler. However, despite this blemish, the judges consider that Mr. Philpot was fully entitled to a very highly commended diploma.

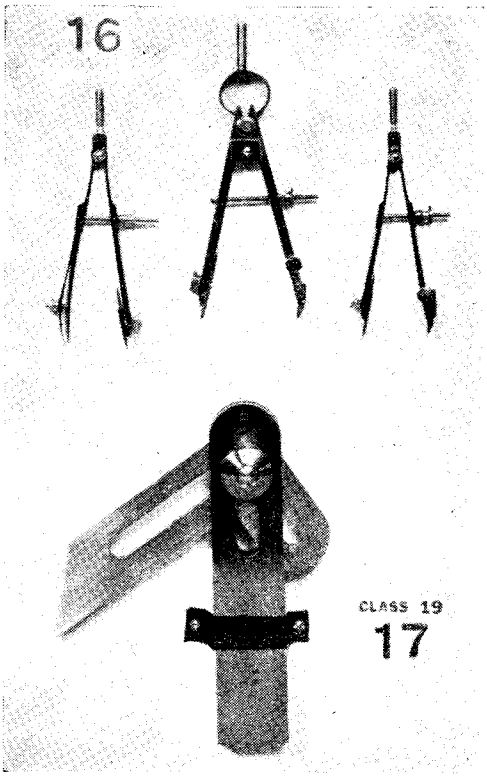
One further very highly commended diploma

was awarded in the class, being given to Mr. D. Marr's two exhibits of three drawing instruments and an adjustable bevel square stock. All were very nicely made and will be a useful addition to the maker's equipment. The judges were particularly impressed by the finish of these tools, which was quite professional, and they would like to comment on the suitability of such tools for construction by juniors. Not only are they good exercises, but they are also useful, and will last their maker for life if properly treated.

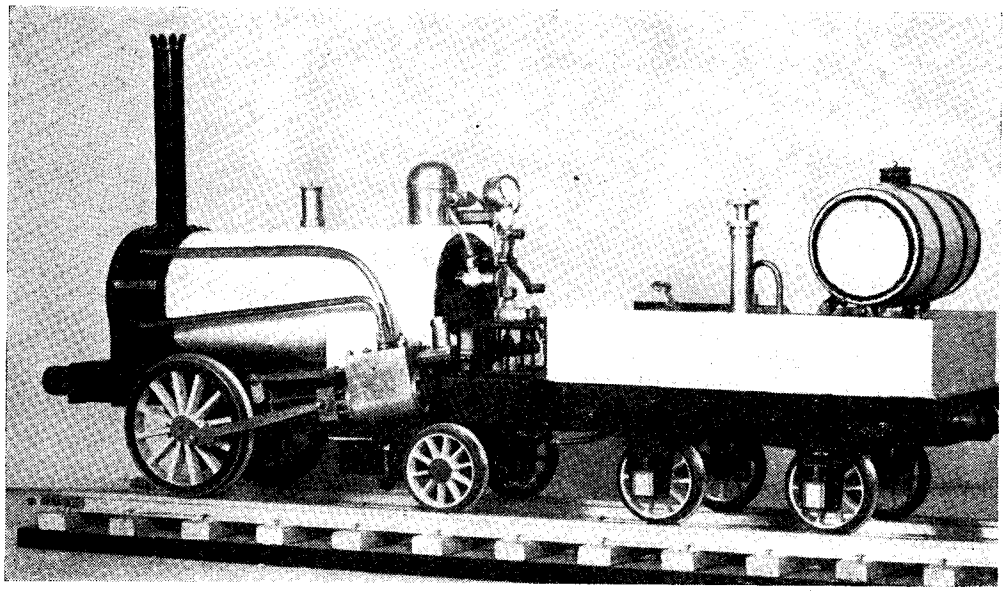
The Model Railway Terminal Station exhibited by Mr. W. A. Hawkins was very representational, and, as work by a 14-years-old competitor with only one year's experience, was highly to be commended. The details have been carefully carried out and leave the impression that further examples of this entrant's work should be forthcoming in future exhibitions. The judges considered that this exhibit deserved a highly commended diploma.

The same award was given to a Norfolk wherry, *Gleaner*, which is an exhibit notable for excellent finish and clean work. In many ways it was superior to Mr. Lovett's air-sea rescue craft, but the volume of work in the latter gave it prior place.

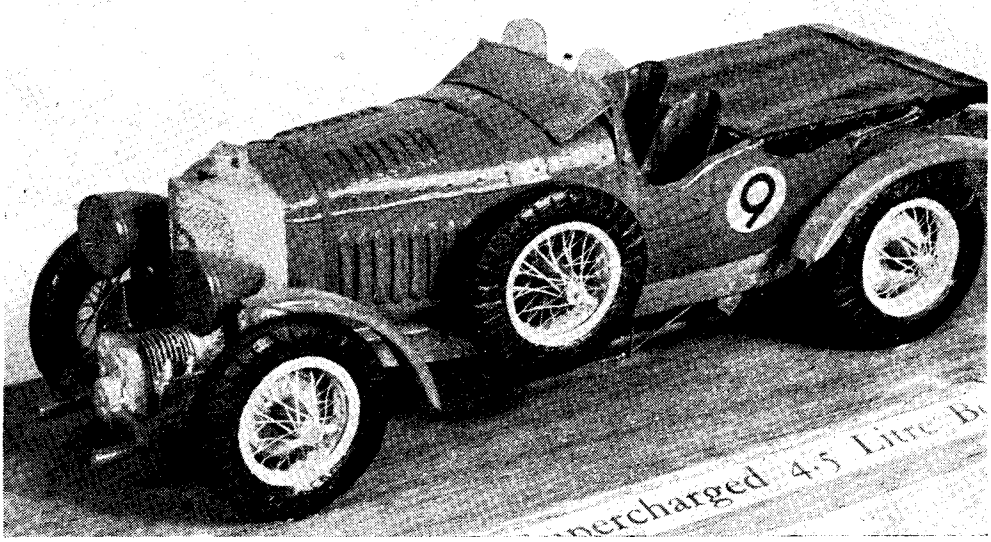
The final award of a commended diploma was made to Mr. G. D. Darling's non-working 1930 4½-litre Bentley car. This was a good representational model finished in correct colouring, the road wheels being an ingenious attempt at modelling the wire-spoked variety.




*Right—Three spring bows and a bevel square by D. Marr*



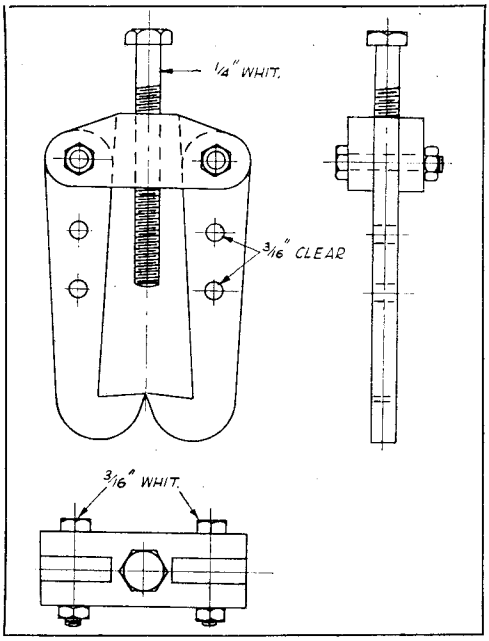
*Mr. A. F. Philpot's "Rainhill" locomotive*




*A model non-working Bentley car by G. D. Darling*

# A Simple Extractor

## by E. E. Judd




THIS tool, which has been made from odds and ends of scrap material, has been found extremely useful for removing small ball-races and wheels from shafts. The main body or stock is a piece of $\frac{7}{8}$ in. square mild-steel which was reduced all over to $\frac{3}{4}$ in. square by 2 in. long. It was then marked out and drilled $\frac{1}{4}$ in. tapping size in the centre, and at $\frac{1}{2}$ in. from each end a $\frac{3}{16}$ in. hole was drilled, and saw cuts made into the holes at each end to form the slots which were afterwards filed out to $\frac{1}{4}$ in. wide and squared at the bottom.

Clearance holes, $\frac{3}{16}$ in. for the pivot bolts were then drilled from the sides at $\frac{5}{16}$ in. from each end and $\frac{1}{4}$ in. from the bottom edge.

The pressure screw is a $\frac{1}{4}$-in. bolt, $2\frac{3}{4}$ in. long, screwed up to within $\frac{1}{2}$ in. of the head.

Two arms were then cut from $\frac{1}{4}$-in. mild-steel plate and drilled with $\frac{3}{16}$ in. clearance holes in each to take the pivot bolts.

No dimensions are given on the drawings of this tool, as it can obviously be made any size required for a particular job, but the drawing is reproduced to a scale of half-size.

# Lathe Centres and a Collet Chuck

## by A. R. Turpin

IT is surprising the number of workers who have trouble with their lathe centres. I have even seen one amateur striking the point of a centre with a raw hide mallet in an endeavour to make it run true! In ninety-nine cases out of a hundred the trouble is dirt in the mandrel; often it is embedded dirt, small pieces of swarf which have been driven into the surface of the bore of the mandrel.

I did have trouble at first with my own centres; cleaning them out with a piece of rag wound round a rod was not to be relied upon, and plugging the bore with cotton-wool had a lot of drawbacks, and a *clean* piece of cotton-wool never seemed to be available, so I decided to lay on some proper cleaning tools. They seem to do the job really efficiently, and I rarely have centre trouble now.

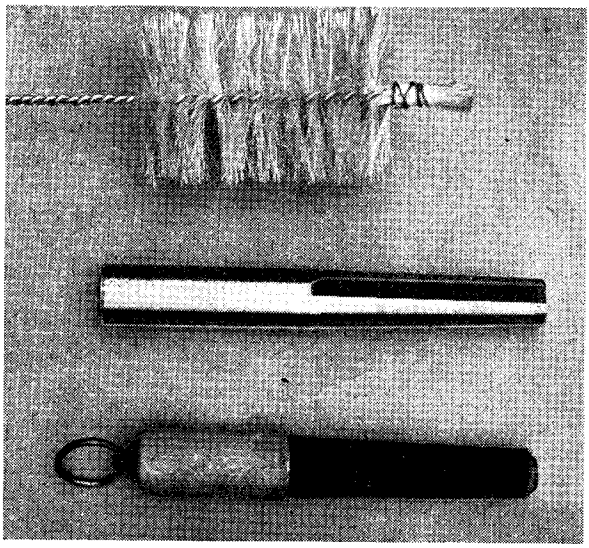


*Photo No. 1. Morse taper cleaners. The brush, scraper and felt-covered plug*

The tools in question are shown in photo No. 1 and consist of:

(1) A bottle cleaning brush. This is drawn through the mandrel from the nose end, handle first. The brush is then shaken and the procedure repeated.

(2) A morse-tapered piece of dowelling covered with a thin piece of felt which has been oiled. After the bottle brush has been used this is pushed into the mandrel bore and given a twist; this removes any small specks of metal left by the brush.

(3) A taper reamer with only one cutting edge. This is used very occasionally, if by some accident the centre has been pressed home, when the bore was not clean, and embedded a piece of swarf in the bore so that it will not move when tools Nos. 1 and 2 are used. There is no real cutting action with this tool, just a gentle scrape, but it does its job.

It will be found that with a clean bore the centres will slide right home with almost a click, and if it does not, the bore is dirty.

As a safeguard against forcing a centre into a dirty bore, a line can be scribed round the lathe centre, flush with the mandrel nose, and it will then be obvious when the centre is not really home, and can then be withdrawn and the bore given another clean before any damage is done.

It is remarkable how few amateur will tackle the job of turning morse shanks for their tools, and this is doubtlessly because it is a very hit-and-miss process when carried out in the usual way, and this normally consists of placing a bar between centres, setting over the top slide to what is thought to be the right angle for the Morse taper, taking a cut and then trying it in a socket, only to find it too acute or too wide an angle. The slide is again adjusted and another cut made, and this time with the opposite result; and so it goes on until the bar is almost completely turned away. A scheme that I use is such that I can fix the top slide accurately to the correct angle in a matter of seconds. I use an M.L.7, but no doubt the idea could be modified so that it could be used on almost any lathe.

I set the top-slide accurately by the trial-and-error method previously mentioned, but once the correct angle had been obtained I clamped everything up tight, and removed the cross-slide from the lathe, complete with the top-slide. I then drilled a hole $\frac{1}{8}$ in. diameter through the outside edge of the top-slide quadrant and taper-reamed it to take a standard taper pin, to the end of which I silver-soldered a milled head; I then replaced the slides (see Fig. 1). All I have to do now when I want to turn a morse taper is to slack off the top-slide holding-down bolts, and swing the top-slide round until the taper pin enters the hole in the cross-slide, and "Bob's your uncle." A word of warning here; although the top-slide can be set exactly as before as far as the angle goes, it will still be possible to turn an inaccurate taper if certain precautions are not taken. The tip of the tool must be at exact centre height, the tool must be of the same thickness and protrude the same

amount from the toolpost as it did when the test cut was made ; otherwise, the spring of the tool will alter the angle, and for the same reason the final cut should always be a mere skim.

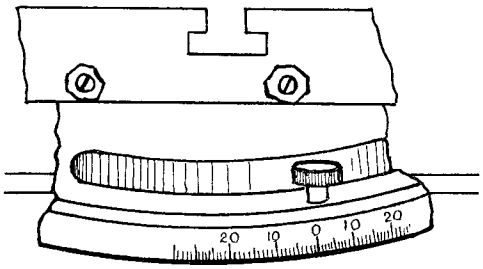



*Fig. 1. How taper pin is fitted to top slide quadrant*

Test the taper with engineers' blue, and a morse taper adapter will save a lot of time if such is used as a gauge instead of the actual lathe sockets. Any slight inaccuracies that may creep in when using the above method of taper turning will be so small that they can easily be corrected with a dead smooth file.

Having described an easy method of turning morse tapers, we now come to the collet chuck. If a list of the main attributes that go to make a good chuck of this kind was to be set out, the following would be the most important items : (1) Accurate running. (2) Ease of manipulation. (3) Small overhang. (4) Large capacity. (5) Simplicity.

I think that I can safely say that this chuck has all those attributes, and I have registered the design, but have no objection to any reader making it up for his own use.

The chuck is shown in Fig. 2, and in photo No. 2, and it will be seen that it consists of a taper collet that is forced into the morse taper socket of the lathe mandrel by a nose-piece that screws on to the mandrel nose, thus compressing the jaws of the collet so that they grip any stock inserted. In order to withdraw the collet from the mandrel, a flat spring steel circlip is slipped over the front of the collet into a groove cut for this purpose, so that when the nose-piece is unscrewed it bears against the circlip, forcing the collet out of the mandrel.

The dimensions will depend on the lathe with which the chuck is used, but for all types of lathes the procedure for making such a chuck will be the same as set out below, and shown in Fig. 3, but the dimensions given refer to chucks suitable for the M.L.7 lathe.

Commence on the nose-piece ; cut a 2 in. length of $1\frac{3}{4}$-in. M.S. bar, chuck in the three-jaw and bore a 1.025 in. diameter hole, one inch

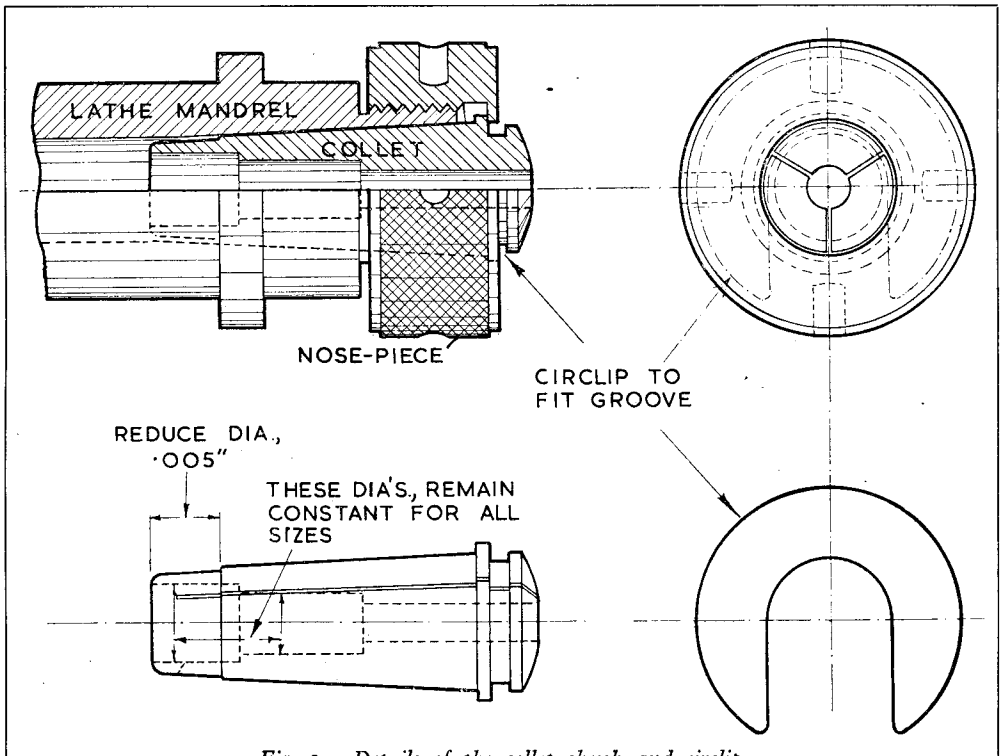



*Fig. 2. Details of the collet chuck and circlip*

deep (detail 1) Fig. 3, commencing $\frac{5}{8}$ in. down this, bore a groove 0.05 in. deep, i.e. having a diameter of 1.125 in., which is the diameter of the thread on the mandrel nose (detail 2); cut a thread as shown to suit that on the mandrel nose 12 t.p.i. (detail 3). Test for fit, and if o.k. part off at $\frac{7}{8}$ in. (detail 4). Now put the nose-piece aside for a while and commence on the first two collets. These are made in pairs, turn true, coarse knurl and turn a small rebate on either edge. Remove from mandrel and drill four equidistant tommy-bar holes $\frac{3}{16}$ in. diameter, $\frac{1}{4}$ in. deep (detail 9). Replace nose-piece, and drill collet with capacity size hole (detail 10). It is as well to commence by drilling the smallest capacity size first, so that should it not run dead true it may be rebored to a larger capacity. Up to, and including $\frac{5}{16}$ in. size, use a "D" bit for

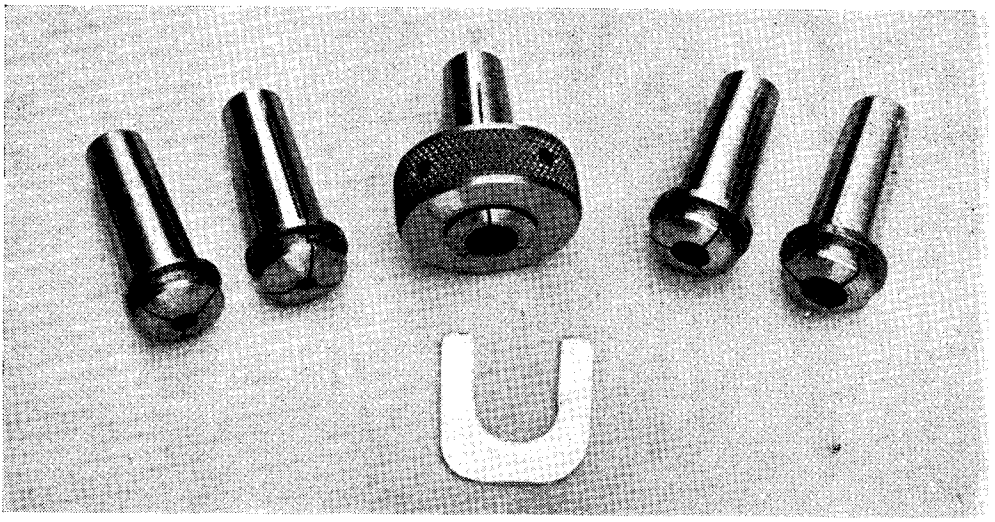


*Photo No. 2. Set of collets and nose-piece*

for convenience and economy of material. This should be of good quality tool-steel, which will give good service even if left in the unhardened state. I use "Microlim," a non-distorting, non-shrink tool-steel of high quality, and which I eventually heat-treat. Cut a 6 in. length of this material 1 in. diameter, and set up to run dead true in the four-jaw; face, centre, and then drill and bore each end to a depth of $1\frac{1}{4}$ in., and $\frac{1}{2}$ in. diameter three thou. oversize, chamfer the edges of the hole with a square centre (detail 5). Bring up tailstock centre, set over top-slide and taper turn to suit No. 2 morse, for a length of $1\frac{3}{4}$ in., and remove sufficient metal for the rod to enter the morse socket all but $\frac{1}{8}$ in. Whatever is used as a gauge for this purpose, check beforehand that a morse centre will enter it the same amount as it does the mandrel, and if otherwise, make the necessary allowance. Now turn the small end of the taper three thous. undersize for a length of $\frac{3}{8}$ in. (detail 6). Commencing $\frac{1}{16}$ in. beyond the large end of the taper, cut a groove $\frac{1}{8}$ in. deep and $\frac{3}{16}$ in. wide, and beyond that reduce the diameter to $\frac{7}{8}$ in. for a length of $\frac{3}{4}$ in., (detail 7). Remove bar from chuck, and the chuck from the lathe. Insert tapered end into mandrel nose, and repeat the previous operations to the other end of the bar, part off at centre (detail 8). Leave the partly finished collet in the mandrel and screw on the unfinished nose-piece; if it fouls the step on the mandrel nose, remove sufficient metal so that there is a $\frac{1}{16}$ in. clearance. Tighten up nose-piece hard, face and drilling the hole; but to use a "D" bit successfully it must be started in a true hole which should have a depth at least equal to its diameter. This starting hole may be drilled with a Slocomb for the smallest sizes, and bored with a minature boring bar for the larger ones. For the larger sizes, drill to a few thous. under size and finish by boring, using a piece of silver-steel as a plug gauge, testing on the waste portion left on the front before continuing the bore right through, and cut on the return stroke without adjusting the slide for the final cut.

Having completed the collets to detail 10, mount them between centres on the vertical-slide, and cut three equidistant slots with a one or one and a half millimeter slitting saw (detail 11). The centring need not be accurate, so long as the collet is parallel with the cross-slide.

The cuts should commence $\frac{1}{8}$ in. from the small end, continue as far as possible without cutting right through the spigot left on the end of the collet; if you do, the collet will spring open under pressure from the centres, loosen and jam, or break the saw.

The brackets can be cut from angle from a Morrison shelter, or similar material. If no slitting saw or vertical slide is available, cut four slots with a fine hacksaw. Remove all burrs from the saw cuts both inside and out with a fine rat-tail file or a round scraper. Remount the collet in the mandrel, insert a scrap-piece of brass rod of suitable diameter, tighten the nose-piece, part off the spigot, and

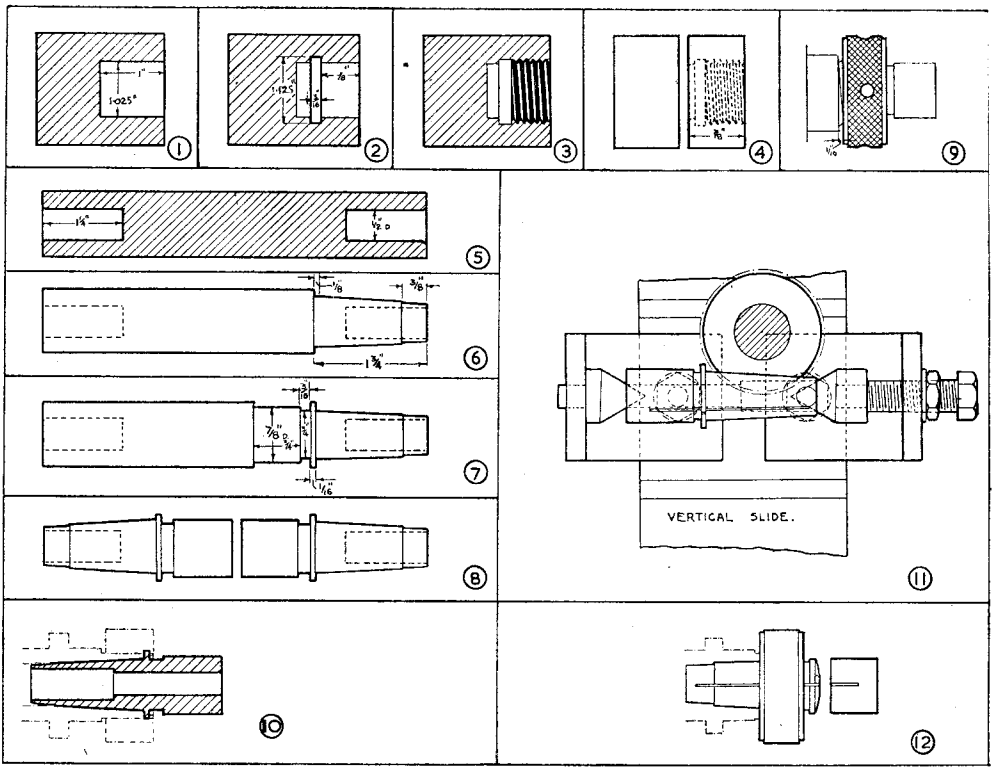



*Fig. 3. Operations chart*

nicely round the face of the collet (detail 12).

If "Microm" steel has been used, heat to 800 deg. C. (a dull cherry red), and quench in paraffin oil; clean up with fine emery cloth and place on a shallow tray of sand, and heat in your wife's thermostatically controlled tempering oven (she may call it her "New World" gas cooker). Make a test first on some scrap metal and then temper to a dark blue.

By the way, if you want to make some decorative lilies for a wrought-iron gate, try dropping a red hot collet into a bucket of cold water

The circlip is cut from 16 s.w.g. spring steel, hardened and tempered to a blue colour.

Stock used in these collets should not vary more than plus or minus two thous. of the nominal size, otherwise the collet will be distorted, and the nose-piece should not be tightened without a suitable piece of stock in the collet for the same reason.

# A Steward Looks at the Exhibition

(*Continued from page* 420)

to them whilst not allowing the show to liquidate itself prematurely. Sunday brings the grim job of diving into the dungeon dark and gloomy which lies under the hall, and bringing up all the cases and packing material, after which begins the work of repacking the models for return by road, rail or personal collection. A nasty moment when an exhibitor says his model has a case which isn't amongst those present, and you lead him down to the dungeon, outwardly confident but inwardly not at all sure that you are going to find it.

Impressions of the show? That the fair sex is taking more and more interest in our pursuits (though I do just wonder whether through the pretty head of the damsel being shown round by her enthusiastic M.E. admirer, there may be passing the thought, that when she gets things a bit better under control she will cure him of this odd eccentricity!).

That, by and large, our great and growing fraternity is made up from the most delightful people in all walks of life, ready, if they have entered a model, to accept thankfully the judges' award, quick to appreciate good work by others and give it praise, and willing to help their fellows by giving the benefit of their own experience and ideas.

And that, appropriately enough, their interests are served by a journal staffed by congenial people, with and for whom the stranger within the gates will find it a pleasure to work.—D.J.R.R.

# PRACTICAL LETTERS

## Refrigerator Details

DEAR SIR,—In response to Mr. E. V. Firth's query in the March 3rd, 1949, issue as to the correct pressure in liquid container and cooling coil of refrigerator when using methyl chloride, I give a list of the pressures of methyl chloride, sulphur dioxide and Freon at various temperatures from 0 deg. F. to 130 deg. F., taken from *Modern Electric and Gas Refrigeration*, by Althouse and Turnquist.

In using this table the following points must be kept in mind :

(1) The temperatures shown are those of the refrigerant.
(2) The temperature of the refrigerant is approximately 8 to 13 deg. lower than that of the cooling coil when the compressor is running, the two temperatures equalising after the compressor stops.
(3) The temperature of the refrigerant in an air-cooled condenser is approximately 30-35 deg. higher than the ambient room temperature.

To take an example. Compressor running, room temperature 60 deg. Condenser (and liquid container) pressure should be as for 90-95 deg. refrigerant temperature, say 95 lb. sq. in.

| | Lb. sq. in. Gauge | | |
|---|---|---|---|
| Temp. deg. F. | Methyl Chloride | ($SO_2$) Sulphur Dioxide | Freon (F12) |
| 0 | 3.8 | *8.85″ | 9.2 |
| 5 | 6.2 | *5.87″ | 11.8 |
| 10 | 8.6 | *2.59″ | 14.5 |
| 20 | 13.6 | 2.5 | 21 |
| 30 | 20.3 | 7 | 28.5 |
| 40 | 28.1 | 12.4 | 37 |
| 50 | 36.3 | 18.75 | 46.7 |
| 60 | 46.3 | 26.2 | 57.7 |
| 70 | 57.8 | 35 | 70.1 |
| 80 | 72.8 | 45 | 84 |
| 86 | 80.3 | 51.75 | 93.2 |
| 90 | 87.3 | 56.5 | 99.6 |
| 100 | 102.3 | 69.8 | 116.9 |
| 110 | 118.3 | 85 | 136 |
| 120 | 139.3 | 106 | 157 |

**Inches vacuum*

Evaporator coil (= suction pressure) is not quite so easily determined, unless a special refrigeration thermometer, placed in a "well" attached to the cooling coil, is used. In my own case, I have immersed a thermometer in a metal vessel of strong brine in the "ice box" and got a reading of 15 deg. F. Taking this as the temperature of the coil (probably not accurate, but at least a guide) the temperature of the refrigerant would be about 5 deg., giving a pressure of 6.21 lb. sq. in. With the compressor shut off and a refrigerant temperature gradually becoming equal to coil temperature, this would rise to about 11-12 lb. sq. in.

Mr. Firth does not give any indication of the ambient temperature but from the date I would not expect it to be very high, and his motor running time does not appear excessive. My own frig. is entirely home-made (including twin-cylinder compressor of my own design) working to the excellent instructions given by Mr. Meyland-Smith, and I get a much better performance than 8 hours running out of 12. Last summer, with temperature about the 80 deg. mark, motor would run four to five minutes, and shut off for 12-15 minutes, thus running about one quarter of the time, while at present, with temperatures 50 to 60 deg., motor only runs for about 10 minutes in every hour, running for about 5 minutes and shutting off for 25. This is maintaining a 40 deg. box temperature in a 6½ cu. ft. cabinet. Box is insulated with three layers of "Pinex," a soft spongy fibrous wall board ½ in. in thickness, outer casing of cabinet 7-ply wood, giving a total thickness of about 2⅛ in. outside the metal lining, so Mr. Firth's 3 in. of cork should be ample.

As to the gas leakage, I advise Mr. Firth to get a refrigeration service man to go over his unit with a halide torch, which will locate the tiniest of leaks, the flame changing colour if as little as 0.01 per cent. of gas is present. I had some trouble with a leak that I could not locate with soapy water, etc., but it was found by the halide torch to be due to a porous casting. I use Freon gas, but the halide torch will also locate a methyl chloride leak.

I hope the above will be of assistance to Mr. Firth in locating his trouble. Perhaps I should mention that he should not expect to get the same on-off ratio as I do from Freon, a methyl chloride unit normally runs more of the time than a Freon, but owing to the lower head pressure the power consumption is roughly equal.

Yours faithfully,
New Zealand. K. J. ROBINSON.

---

## Ploughing Engines

DEAR SIR,—A farmer at Old Dalby, Leics., Mr. C. Grice, has a pair of Fowler Compounds ; I believe the Nos. are 14,148 and 9, built about 1918 and classed, so he says, as 16 h.p.

These engines, which are still in regular use, have only one injector, and no pump, and, as there is no eccentric and no bolt holes for fixing a pump, have presumably never had pumps.

This same farmer has, among other engines, an old single-cylinder "Fowler" not now in use, which is the opposite of the above, being fitted with one pump and no injector.

It appears from this that Fowler's did not consider agricultural engines worth the expense of two separate boiler feeds.

Yours faithfully,
Leicester. R. Taylor.

### "Kiwi"

DEAR SIR,—I would like to point out that the boat entered in my name that won the Class "C" restricted event at Victoria Park in the Grand Regatta, was a joint effort, the hull being made by my friend Mr. I. Williams, also of Bristol.

Yours faithfully,

Bristol. G. Kington.

### To Certain Contributors

DEAR SIR,—The article on chemical silver plating (July 21st issue) contains the astonishing suggestion that ½ oz. of silver chloride will dissolve in 3 to 4 oz. of water. In fact, this quantity of silver chloride would require almost ten tons (yes *tons*) of water to dissolve it. Possibly your contributor really intended to describe plating, using a paste of the chloride.

There has been a number of similar errors and misleading statements in minor articles of late. Luckily these articles are readily distinguished from those of reliable authors who first check their theories and finally their manuscript.

The worst example is the simplified magnetic clutch described in the issue of March 24th. Had your contributor been content with his description of the clutch as developed by the Bureau of Standards, he would still have served the useful purpose of directing readers' attention to the device. His model version, on the other hand, merely serves to show a lack of understanding of the mechanical and electrical principles of the original design. The model coils are placed to produce the maximum magnetic field strength at the axis of the shafts where it is of least value in transmitting torque. In addition, the coils will set up eddy-currents within the rotating shafts, giving a braking effect proportional to r.p.m.

Finally, may I suggest that someone be commissioned to throw some light on the meaning of efficiency. The last article on the subject (June 2nd issue) gives a formula measuring small loco efficiency in terms of pounds per B.T.U. per second—or, putting the B.T.U. in terms of work, reciprocal length per second!

The general standard of THE MODEL ENGINEER is as high as that of any technical journal, and the rare bad articles are, therefore, all the more conspicuous.

Yours faithfully,

Warrington. W. H. Nightingale.

# CLUB ANNOUNCEMENTS

**The Hatfield and District Society of Model Engineers**

The above society are holding their first exhibition at the Memorial Hall, Hatfield, from October 3rd-8th. The exhibits cover a good range, and attractions include a passenger-carrying track for the youngsters. As the society has a great deal of work on, it is hoped that new members may be attracted.

Hon. Secretary: D. WHEELER, 28, Endymion Road, Hatfield, Herts.

**South London Model Engineering Society**

An interesting series of talks, etc. have been arranged for the winter session, now that we have resumed alternative Sunday morning meetings. These will commence at 11 a.m. and will be held at Dog Kennel Hill, East Dulwich.

On October 2nd a lecture will be given by Mr. A. Dunbar on "Traction Engines," and on October 16th Mr. A. W. Stone will talk about boats.

Full particulars of membership can be obtained from the Hon. Secretary, W. R. COOK, 103, Engleheart Road, Catford.

**The Tees-side Model and Experimental Engineers**

On Tuesday, September 6th, at the headquarters, 400, Linthorpe Road, Middlesbrough, Mr. Worthington, the chairman, gave a very interesting talk and demonstration, with the aid of slides, on "Flight and Radar."

Similar talks and demonstrations will be given by other members every fortnight from the above date, at 7.15 p.m. New members are especially welcome.

Hon. Secretary: J. W. CARTER, 28, East Avenue, Billingham, Co. Durham.

**Harrow and Wembley Society of Model Engineers**

On Wednesday, September 7th, Mr. S. C. Saunders gave members a talk about "Oil in the Service of Man," at Heathfield School, College Road, Harrow. He brought with him many interesting samples connected with the winning of oil and a fine model of an early well borer. He also showed a number of lantern slides. Mr. Saunders is secretary of the Harrow Scientific Film Society, and founder of the Harrow Scientific Society.

Hon. Secretary: J. H. SUMMERS, 34, Hillside Gardens, Northwood, Middx.

**Glasgow Society of Model Engineers**

*Alteration in arrangements re exhibition.*—A last-minute alteration of dates has been necessary in connection with the exhibition in the Engineering Centre. Whereas the previous dates were October 1st-10th, both inclusive, they have now been altered to open October 4th and run until October 15th.

The first 1949/50 meeting will be held in The Engineering Centre Rooms, 351, Sauchiehall Street, Glasgow, C.2, on Saturday, October 15th, at 7.30 p.m.

Gavin Hamilton will describe his 7¼-in. gauge 2-6-0 locomotive and have same on view. This gathering will form a fitting close to the exhibition, and takes place upon the same premises, within the lecture hall.

Visitors will be welcomed and particulars of membership can be had from the address below.

Secretary: JOHN W. SMITH, 785, Dumbarton Road, Glasgow, W.1.

**Ickenham and District Society of Model Engineers**

Our annual general meeting will be held at the Memorial Hall, High Road, Ickenham, on September 30th, at 7.30 p.m., where we shall continue to meet every Friday thereafter, having ceased our tenancy at Ickenham Hall.

The new venue is one minute from the bus stop on routes 98, 220 and 223 and is almost opposite the "Fox and Geese," or five minutes' walk from Ickenham (Met.) and West Ruislip (Central London) stations.

We have now eight weeks' programme arranged, the latest four as under:—

November 4th. "'O' Gauge Construction from Destruction" November 11th. "Snags" Night; November 18th. Club Night; November 25th. "Boiler Construction."—Talk.

Hon Secretary and Treasurer: H. C. PIGGOTT, "Chatsworth," 23a, Parkfield Road, Ickenham.

## NOTICES



The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. **All such correspondence should be addressed to the Editor (and not to individuals)** at 23, Great Queen Street, London, W.C.2. Matter intended for publication should be clearly written, and should invariably bear the sender's name and address.

**Readers desiring to see the Editor personally can only do so by making an appointment in advance.**

All correspondence relating to sales of the paper and books to be addressed to THE SALES MANAGER, Percival Marshall & Co. Ltd., 23, Great Queen Street, London, W.C.2.

Annual Subscription, £2 2s. 0d., post free, to all parts of the world.

Correspondence relating to display advertisements to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 23, Great Queen Street, London, W.C.2.